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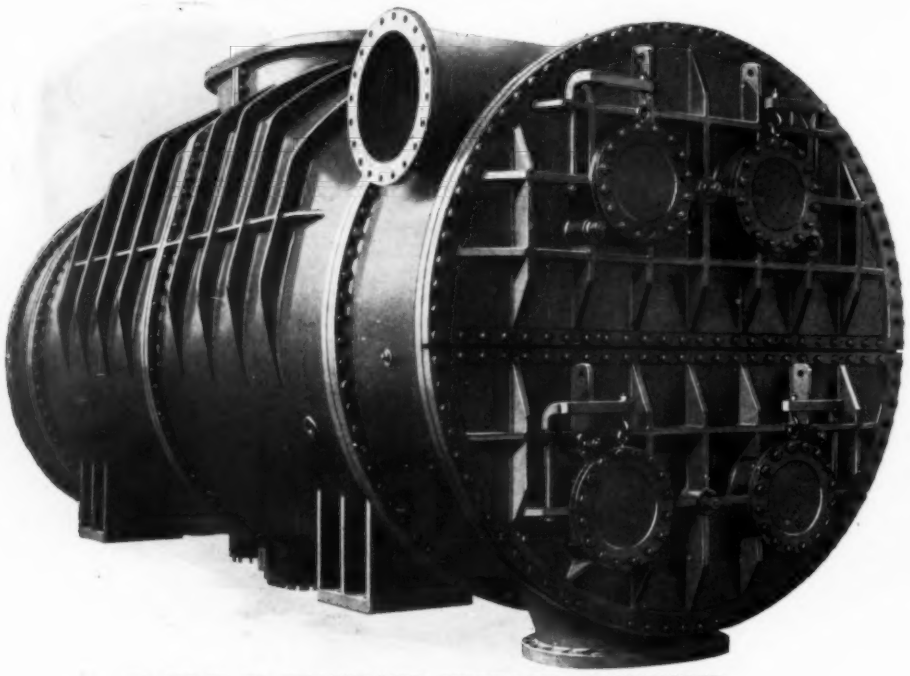

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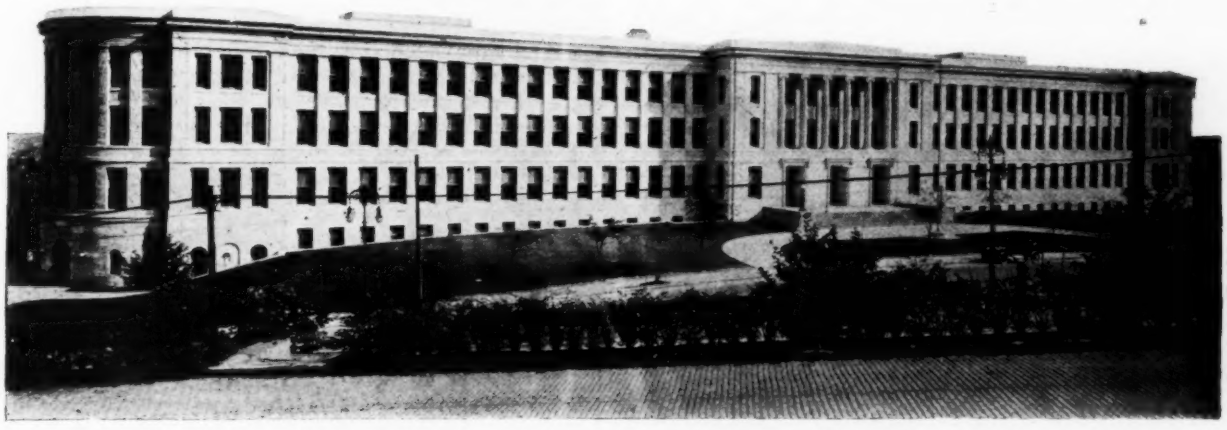


Front View of Schenley High School, Pittsburgh, Pa.

Electric Motor Drive in the Schenley High School in Pittsburgh

New $1,000,000 Institution Exceptionally Well Equipped—Motor-Driven Ventilating System—Individual Drive in Manual Training Rooms—Pupils Make Many Useful Articles for American Red Cross

By D. H. COLCORD

Westinghouse Electric & Manufacturing Co.

IF SURROUNDINGS have anything to do with the training of boys and girls, then the students at the new Schenley High School of Pittsburgh, Pa., ought to do work that should average something near 100% perfect. Located in the civic center of Oakland, the splendid educational and residence district of Pittsburgh, it occupies a commanding view of Schenley Park and is within easy walking distance of the Carnegie Institute of Technology, the Masonic Temple, the Syrian Mosque, the Pittsburgh Athletic Association, the Schenley Hotel, Forbes Athletic Field, the University of Pittsburgh, and other notable institutions and buildings.

The beautiful building, which cost about $1,000,000, occupies four acres of ground and is in the shape of an isosceles triangle with a base of 468 ft. and sides of 250 ft. It is massive and dignified in appearance, almost severely plain with no ornamentation except the columns and frieze at the front entrance. It is constructed of steel and concrete built upon 1700 concrete piles, and is faced throughout with Indiana limestone. The auditorium which occupies the center is flanked by open courts and surrounded by broad corridors, along which are the class rooms, laboratories, workshops and lunch rooms. The courts furnish daylight to the auditorium and class rooms. The building as a whole contains 40 class rooms, 11 laboratories, 11 shops, 4 craftsrooms, 7 domestic science rooms, 2 music rooms, 6 commercial rooms, a large library, a girls' and a boys' gymnasium, a swimming pool, reception rooms, rest rooms and 20 toilet rooms—a total of 180 rooms.

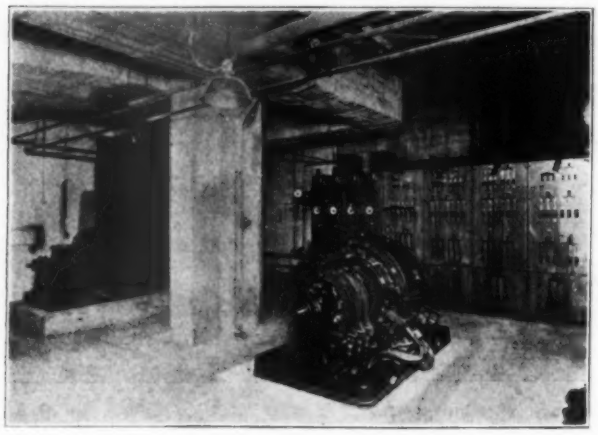
The new Schenley High School, unlike a number of recently erected schools which are devoted to a particular course, offers a number of different courses. The recent tendency has been to build academic high schools, commercial high schools, manual training high schools, etc., but James N. Rule, the principal of Schenley, strongly advocates a general grouping of all the courses under one roof. He says that a student is often guided in his choice of vocation by the fact that a commercial or a Latin high school is near his residence. He believes that the average student is not prepared for any sort of specialization until his senior year and prior to this time should get a general broadening course of instruction, and that a general high school is the greatest asset for democracy in the community.

The "Schenley" has a thousand points of interest, extending from its kitchen, equipped with the latest

electrical cooking appliances, to its expensive reproductions of famous paintings. This article, however, will be confined to the school's electrical equipment, and especially the power-driven machinery in its industrial departments.

General Features of Electrical Equipment of School.

First let us hastily examine a few applications of electricity in general use in the building and thus proceed directly to the manual training shops. In the



Switchboard and Two 300-kw. Westinghouse Rotary Converters at Schenley High School, Pittsburgh.

general office a telephone switchboard is installed giving service to every room in the building. Here also is the master electric clock which controls 27 secondary clocks throughout the school. The clock has a program attachment so arranged that 100 bells for assembly and dismissal are rung automatically in every class room at the beginning and end of periods. The auditorium has one of the finest lighting facilities in the country and is also equipped with a complete motion-picture booth.

In the chemical laboratory is found every electric device that is used for practical demonstrations from electric ovens to motors and fans for removing fumes. The most striking features of the physics room are the switchboard of six panels distributing electrical energy to all sections of the department, a display panelboard, auxiliary motor driven tools, three kinds of lathes, band saws and electrical attachments for work benches.

In the kitchen we find an electric potato peeler, chopper, dishwashing machine and a meat and bread slicer. In the bakery an electric motor drives a one-barrel dough-mixing machine and a three-speed cake mixer. An electric proofing oven is used for raising dough, and an electric bake oven bakes 40 dozen rolls at one time.

The power plant is probably the most complete to be found in any public school. The capacity of the boilers is 1350 hp.; they are fired by mechanical stokers. All the power current used is transformed to 230-volt direct current through two Westinghouse 300-kw., 6-phase, 60-cycle, 1200-r.p.m. rotary converters. The switchboard in the power plant is a 6-panel board. The two panels at the right are the alternating-current panels for the lighting system, which is a three-wire system. The two panels in the center group are the direct-current power panels on which are mounted the switches that control the supply to the power distributing boards throughout the building. The two panels on the left govern all the electrical supply, including the two rotaries; they have the following equipment: two ammeters, rheostat, two main switches and two wattmeters, and one voltmeter for both panels.

There are eight air washers to cleanse and humidify all the air in the building, the same apparatus being used to cool the air in the summer time. The forced draft is created by 23 motor-driven fans. For the exhaust of the general ventilating system there are two 25-hp., 230-volt motors, and four of the same type for the inlet. Eight 5-hp. motors are used for carrying off the air in the kitchen, service room, laundry, lockers, closets and laboratories. Ordinarily the ventilation in the auditorium enters beneath the opera chairs and passes out through the ceiling, but in case of a large audience this process is reversed and the air enters at the ceiling and passes out under the chairs. All motors for all the ventilating systems are of Westinghouse make.

Equipment of the Manual Training Department.

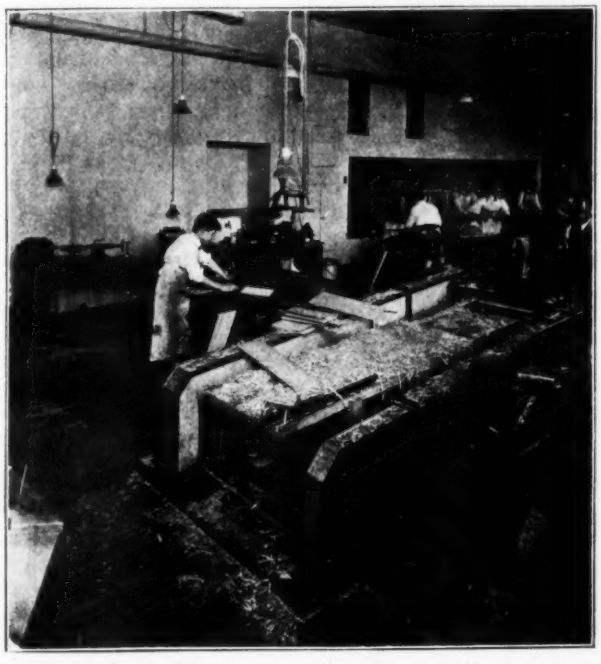
One of the most interesting features of the entire manual training department, which is located on the ground floor, is its utilization of electric power. It is carried to the numerous machines in the metal and woodworking rooms and applied to direct-current motors. When one first steps into these workshops one is immediately surprised that there are no long lines of shafting, no tiers of whirling belts, no dodging this or that open drive, or feeling that one may get tangled in the machinery. It doesn't look like the commonly held conception of a factory. The reason for this surprise is due to the fact that the equipment is so modern that one is not ready for it. Every lathe, every band saw—in fact, the entire machinery is driven by individual motors with no belting, or at least a very short direct drive. Obviously this means much in the way of protection for the awkward irresponsible boy of freshman years; he is able to devote his entire attention to the operation at hand and his attention is not diverted with the constant fear that his sleeve may be caught in a belt. It means something, too, to use only as much power as is required for the particular machine in service. With the old system, the entire shafting system must be kept in operation in order to operate but one lathe; belts had to be run loose to avoid accident, and then there were the constant re-

Boys at Schenley High School Working in Manual Training Department on Junior Red Cross Work.

View of Manual Training Room Showing Motors Driving the Woodworking Machinery.

pairs. Shafting and belting require oil cups that often drip, in fact they make the manual training room a dirty place so that the fastidious high school youth hates to go back to the English class room with a soiled collar and greasy trousers.

The Schenley manual training shops are unusually free from the dirt and grime that collects in such places. Here is industry, manual work such as the boy sees and admires in the outside world throughout the busy Pittsburgh district. So the original surprise bordering on disappointment of the visitor is soon dissipated in the atmosphere of work and interest found here. The boys are happy and zealous in showing one what they are making.



Another View of Manual Training Department Showing Motor Drive and Safety Appliances.

For the past year the metalworking department has been turned over to the soldiers who were encamped in Schenley Park, so that the principal high school work has been done in the woodworking department. This department includes two spacious rooms connected by the instructor's office, which opens into each room. The space back of the office and between the shops is used as a lecture and demonstration room, including an instructor's table and a small amphitheater. Each shop room is 36 by 80 ft. in dimension, thoroughly lighted by day through 8 plate glass windows extending nearly from floor to ceiling.

Of course, the first requisite of a modern woodworking department is its machine equipment, and the Schenley has everything that an instructor could desire. The upper half of each shop is given up to work benches. There are 12 in each room, all numbered for the purpose of easy assignment. Each bench contains 12 commodious individual drawers and two cupboards to hold tools, waste, etc. The top is covered with a heavy block of hardwood, 5 ft. by 3 ft. by 2 in., to which are attached vises, whetstones and electric glue

Surfacer and Circular Saw With Individual Motor Drive.

pots. Each room also contains an instructor's cabinet and a glass-covered tool case built in the wall.

There are 22 woodworking lathes distributed throughout each room. They are driven by individual headstock motors and are not anchored to the floor but may be shifted easily from one position to another. These lathes are used for turning, chucking and sanding everything from hall trees to stocking stretchers. The motor has four speeds, no belt, and is absolutely safe and foolproof. The boys like to use these lathes because here is action,

In the center of each room is a standard size surfacer, driven by its own motor, the short belts completely guarded with wire screening and sheet metal frames.

One of the finest machines on the floor is the band saw. There are two of these, one at the lower end of each room, and it is the special desire of every boy to be given permission to operate them. They are of Fay & Egan Co. make, completely guarded with Jones safety guides and individually driven by two type SK 3-hp. motors which have given excellent service.

In the center of each room is a standard size circular saw made by the Colburt Machine Co., equipped with Jones safety appliances, and driven by a type SK, 5-hp., 230-volt motor. The motor is located at the rear and at the base of saw and the short belt drive is so completely protected that it is not even visible. When a boy reaches his senior year he is instructed in pattern making and the shop is well provided with the correct machines.

Two universal grinders are set flush with the walls to keep the room free from dust. The wheels are carefully guarded by steel curtains and the short belt is not visible. These grinders are driven by two type CD ½-hp. motors. Fay & Egan jointers are installed here, protected by Jones screens and driven by type CD, 1-hp. motors. Two wood trimmers and an electrically-driven saw filer complete the equipment.

All of the machines in these shops are driven by Westinghouse shunt-wound direct-current motors. Every machine in the Schenley woodworking shops is of standard size, that is, they are the same make of machine that is used by any commercial industry of the kind in the country which means that the boy who leaves the school has nothing to relearn, as is often the case where a "baby" model is used.

Method of Shop Instruction and Nature of Work

The method the instructor has worked out for handling tools is interesting. Each boy keeps his tools in his own bench and is responsible for them during the period he works in the shop. At the close of the period he is required to check them and report his check to the incoming boy that has his table. The instructor assumes no responsibility except that he inventories the entire shop every month and any tool destroyed or missing is charged against the last boy. One can see that no boy is liable to let the boy that proceeds him at the bench report tools missing.

The general shop practice is similar to that of the average shop. However, there are a few features that are unusual and worthy of mention. A total of 165 students are given instruction every day. Four years' work is given in manual training and the majority of boys carry 100 hours of work each semester. One of the "hobbies," so-called, of the principal is that every student in the Schenley High School, regardless of the course he is taking, must take one year's work in some study that trains the hands. He believes the result of such training has a strong democratic tendency.

A Schenley High School Boy Operating a Band Saw That Is Driven by a 3-hp. Motor.

Exhibit of Work Done by Boys in Manual Training Department.

All of this work was done for the American Red Cross Convalescent Hospital in France. The exhibit includes (looking from left to right) bedside table, crutches, tableware chest, specially designed rocker crutches; above (looking from left to right), blue and red desks, and a special table for placing over the bed of the convalescent soldier.

In regard to the nature of the work done, the boy selects for his piece of work anything that he desires to make, providing of course that the article that he chooses is within the class of operations he is familiar with. In scope the product includes household furniture, lamps, candlesticks, reading tables, desks, hall trees, stocking driers, tailor's arms, etc. The principle at the basis of the instruction is that the boy takes the most interest and does best that which he likes best.

The fundamental operations are taught by the same method that is used in a physics or chemistry laboratory. The instructor demonstrates the principle in the class room, setting the standard, and the boys carry it out on their individual tasks. Besides doing their regular work, the boys themselves repair the machines and general equipment, thus learinng about their construction, operation and maintenance.

Since the United States entered the war, the manual training departments of the Pittsburgh schools have devoted almost their entire time in the service of the American Red Cross. Schenley High School had led the Junior Red Cross in this country in standardizing the articles that were made by our school children and shipped to the hospitals in France, so that the work done in this woodworking department has received national recognition.

This high school has made 300 bedside tables, 20 tableware chests, 15 Red Cross house tables for convalescent homes for soldiers. These house tables are made in three colors, green, blue and pink, to harmonize with color schemes adopted in the convalescent hospitals. When the armistice was declared considerable progress had been made on a number of specially designed crutches for disabled soldiers and 50 were made last year. A stationary desk to be used by a patient who is not able to leave his bed is also one of the novel features of the work. Besides these articles, which are shown in one of the illustrations, hundreds of other separate pieces of furniture were made for the Red Cross houses.

Construction, Extension and Upkeep Policies of Central Stations

Although Many Companies Are Marking Time, the Majority Are Ready to Resume Progress of Plant Betterment, Line Extension and New-Business Development to Suit Conditions

ABUNDANT and reliable supply of electricity has become so essential to every community that the ability of central stations to furnish such supply has become a question seriously affecting the welfare of the community. If central-station plants and distributing systems are of ample capacity and extent, and in such condition as to be able to meet all demands upon them, these demands can develop without hindrance, the community can continue to grow unhampered and both capital and labor can be employed with at least one essential element—power—abundantly available. If, on the other hand, the capacity of power plants has reached the point where there is little or no reserve left, when these plants have suffered in maintenance, when line extensions to new and favorable industrial and residential districts are no longer being made, normal development throughout the community is likely to be seriously checked. War conditions have unavoidably brought about these latter conditions in a great many central-station systems. The attitude of central-station companies as to the continuance or correction of these conditions is therefore of great concern just now to our cities and to the country as a whole.

To the electrical industry central-station policies on these matters are of even more vital concern, because the prosperity of the power companies is closely reflected to the industry in general. Central stations are among the largest purchasers of electrical apparatus and supplies. Their policies as to construction and rehabilitation, especially as to plant enlargements and betterments, line extensions, etc., are therefore of keen interest to all electrical men and those closely allied to the electrical industry.

In order to obtain reliable first-hand information for the benefit of the electrical industry about the attitude of central stations on these important matters, the ELECTRICAL REVIEW has made a careful survey of policies and plans of a very large number of central stations in large, medium and moderate-sized cities. These stations are both large and small, and quite typical of the entire central-station industry. The high percentage of replies received is therefore believed to give a good general summary of the various opinions on these matters now held by representative central-stations managements.

Another survey was made of the attitude of these companies respecting the resumption of active solicitation of new business. In this case the managers of the new business, sales or contract departments of those companies that have usually been prominent in aggressive development work were written to or personally interviewed. It was felt that if there was to be resumption of such sales effort, it would under present conditions be expected from such companies as have previously had successful experience in this work. The opinions expressed on this subject, and referred to in another section of this issue, are therefore believed to be indicative of what may be anticipated in this line under reasonably favorable circumstances.

The first point that was observed was that many companies are now very carefully considering all these matters and expect to take definite action upon them in the very near future. Eagerness is expressed by all the stations in this group to do the utmost in the way of necessary or desirable construction that is warranted by the circumstances. Uncertainties as to costs are naturally withholding the final approval of much contemplated work, until the conditions can be better judged as to how extended these undertakings should be made in order to correspond with profitable investment. The opinion is quite generally held that rehabilitation on a large scale, extensive new construction and liberal line extensions are warranted only to the extent that these betterments and increases in capacity will bring such a high return on the excess investment involved under present prices of material and labor that this excess cost above normal can be written off or amortized in from five to ten years. In view of this state of affairs, final budgets for this year's program of new work are in many instances still unsettled.

The basis for this policy of going slowly and surely is found in the difficulties experienced by so many central stations during the war. The high cost of fuel, supplies and labor has necessitated the closest economy by practically all companies, and especially those whose rates could not be correspondingly raised on account of franchise limitations, lack of power of regulatory commissions, or other causes. Obviously, these companies are necessarily constrained to go on slowly until the return of more normal conditions and any expenditures now authorized must be of such character as will surely be profitable from the start.

In view of these circumstances a minority of the companies, probably not over one-third, have definitely decided to take the most conservative attitude and engage in substantially no important construction or betterment work this year unless a very material improvement in the present business situation and in load requires it. These companies have sufficient capacity to handle existing demands and therefore contemplate no additions thereto or to their lines, unless it be in the nature of short extensions to serve customers with substantial loads. However, they expect at least to maintain plants and lines in good condition, which is much better than the situation a year or so ago when even normal upkeep was in many cases cut down.

REVIVAL OF REHABILITATION AND CONSTRUCTION WORK BY MANY COMPANIES.

Aside from high costs and shortage of men, checking of important construction work during the past year resulted from the orders of the War Industries

Board which had to curtail the normal use of materials so as to conserve them for prosecution of the war. Only those projects were approved as were of manifest national interest or which, having been started, would involve heavy loss if not completed. Consequently a great deal of work planned by the central stations during the latter part of 1917 or later for execution last year was never begun and is now waiting only for favorable conditions. At present it is largely a question merely of opinion as to whether conditions are sufficiently favorable to warrant undertaking this work. The scarcity of men no longer exists, the orders curtailing the use of materials have been removed, so that the only hindrances left are continued high costs and some difficulties in financing. Both these matters, which will be referred to again below, have in many instances been taken care of, so that construction work is being resumed by a gratifyingly large number of central stations.

This is especially true in those cities where the companies were not called on to increase plant capacity during the last year and a half in order to serve munition plants, shipyards, and other war industries, because in such cases ample reserve capacity now exists as a rule since the war loads have almost vanished. Those cities where there was very heavy war business are the very ones also in which construction work was seriously checked. Consequently, they find themselves in need of greater reserve generating and often also distributing capacity, and of affecting many improvements in plants and lines that suffered because of inability to carry out customary upkeep work.

Optomistic Outlook Inspires Building Work.

The case is not exclusively one of necessary increased capacity, however, as many companies are inspired by optimism at the general outlook. While they find themselves able to easily handle present business, they consider it desirable to be in such condition as to take care of material increases that may come in the not distant future. Readjustment to peace status is being made steadily and will, no doubt, be greatly accelerated by actual signature of the peace treaty. The purchasing power of the people was perhaps never greater than now, in spite of high prices and high taxes. Very many cities are deficient in housing facilities, so that apartment and residence building will have to be undertaken. This will increase the load in residence districts. The people have restricted their purchases of clothing, furniture and other supplies during the war and these must be replenished. To supply these wants will stimulate business greatly, which in turn will cause many industrial plants to make necessary betterments that could not be made during the war.

Extensive road building and other public works also will stimulate general business improvement, all of which means heavy increases in electrical loads of central-station systems. Special loads developed during the war, such as electric welding and electric furnace work, will probably continue and may even grow through new applications. The present mild winter has diminished the harvesting of natural ice, so that the demand for electrically made artificial ice will no doubt be heavier next summer than ever. These are but a few of the reasons why progressive central stations are taking an optimistic view of the situation and preparing for important developments.

But this is only part of the story. Quite a few central-station companies feel that they should not only be in a position to furnish electric service for future peace needs of the community, as they were in furnishing urgent war power loads, but that they should help solve the growing unemployment situation. This idea is not confined to the large companies by any means. The manager of the central station in the modest town of Fessenden, N. Dak., writes that, "We are eager to do our bit in absorbing the surplus of labor that has accumulated and must be cared for by our industries even if necessary at a sacrifice of our profits; therefore, we are contemplating and arranging a 19-mile extension of a high-tension line to an adjoining town, also an 8-mile extension of one of our present high-tension lines into a new territory. We are also endeavoring to interest a third town in these connections, which if accomplished will necessitate the addition of a 200-hp. complete unit in our plant." If a small company can take this progressive stand, surely some of the larger and more resourceful organizations can do as much.

Respecting the prevailing tendency for prices of materials and labor to remain rather high, the feeling is spreading that the decreases that have already occurred have probably reached a fairly stable level, because much new work has to be undertaken without further delay. This will bring about employment of labor and stabilize the material market. The price of copper and of other essential central-station supplies has already been very materially reduced, so that those companies which have need for undertaking line or power-plant work without further delay cannot afford to wait for possibly remote further reductions. Such further decreases may come gradually but the higher cost involved in undertaking work without waiting can usually be compensated for by extra returns that the prompt completion of this work will make possible.

Character of Work Under Way and Contemplated.

The work under construction and contemplated for execution during the present year is of varied character. Only a few typical examples are cited in the following to give some idea of the character of this work. In the way of large plants is the new steam-electric plant of the Kansas City Light & Power Co., Kansas City, Mo., a brief preliminary description of which was published in these columns last year. This plant was started late in 1917 and eventually will contain six units. At the present time two 20,000-kv-a. steam turbogenerator sets are being installed, together with all the necessary appurtenances. A 13,200-volt underground transmission system is being installed to connect this plant with the various substations, of which two new ones are being built.

The Denver Gas & Electric Light Co., Denver, Colo., is completing a 12,500-kw. addition to its plants. At Warren, Ohio, the Trumbull Public Service Co. is proceeding with the installation of a 12,500-kw. turbogenerator set. The Rockford Electric Co. is planning for considerable extensions and expects to install a 7500-kw. turbogenerator with various improvements to coal-handling machinery, and additions to its present distribution lines in Rockford, Ill. At Elyria, Ohio, the Lorain County Electric Co. is completing as rapidly as possible its new 8000-kw. power station, the first unit of which it is hoped to place in service this summer. A 1250-kw. turbo set is to be installed by the City Light & Water Co. at Armarillo, Tex. At New Philadelphia, Ohio, the Ohio Service Co. is installing a 4000-kw. turbine and surface condenser unit. It is also installing additional circuits to existing 33,000-volt transmission lines between Newcomers-

town and Cambridge, 20 miles, and New Philadelphia and Dennison, 10 miles. The Hanover Light, Heat & Power Co. has plans to install a 1000-kw. turbogenerator, surface condenser and spray cooling system at Hanover, Pa. Certain existing lines are to be increased in capacity by raising the voltage to 13,000. The Virginia-Western Power Co. is completing a new steam-electric power plant and some additional high-tension transmission line to tie in with its hydroelectric system. At the power plant of the Tide Water Power Co. at Wilmington, N. C., there is being installed a 2500-kw. turbogenerator with barometric condenser, two 600-hp. boilers, two 1500-kw. transformers and necessary auxiliary equipment.

In the line of hydroelectric development a few typical cases may also be mentioned, one of which is the extension of the facilities of the Southern Sierras Power Co., Riverside, Cal. This company is building additional steel pipe lines so as to increase the capacity of its several plants along Bishop Creek. These pipe lines aggregate nearly 3½ miles in length. The capacity of Plant No. 5 will be increased by a new 1500-kw. unit. An increase in voltage of the transmission line from Bishop Creek to San Bernardino will be made to correspond with the increased load demands. In Maine, the Bangor Railway & Electric Co. plans to install three water wheels of 250-hp. each at its Veazie plant, and the Bar Harbor & Union River Power Co. is planning to install a 3000-kv-a. water wheel unit at its Ellsworth plant. The Vermont & Quebec Power Corporation plans the building of a new plant on its water-power holdings along the Missisquoi river, Vermont; about 1500 hp. will be developed and a 13,000-volt transmission line of 15 to 22 miles length will be built. Another 500-kv-a. unit is to be added at the Richford, Vt., plant. Typical of some of the smaller developments is the contemplated development of two water powers by the Milford Electric Co. at Milford, Mich.

The lull in street-lighting developments that characterized the last year especially is giving way and considerable work is being planned in this line. The city of Chicago, which spent several million dollars last year, hopes to continue the extension of its municipal system although the budget has not been approved at this writing. The Public Lighting Commission of Detroit plans to expend about $500,000 for the construction of conduits, underground cable, pole lines and street-lighting equipment. The municipal plant at Ottawa, Kans., is preparing specifications for a 500-kw. unit employing either steam engine or turbine. At Brigham City, Utah, improvements costing about $12,000 are contemplated. A new series lighting system will be installed in the business district and a new secondary distribution system is contemplated so as to serve to supply the lighting of the business district more satisfactorily. The Lexington Utilities Co., of Lexington, Ky., is considering the rebuilding of a part or perhaps whole of its street-lighting system of about 700 lamps, changing to a straight series Mazda system.

The foregoing examples of new work and extensions have been picked at random from reports of an extremely large number of projects. They are typical of the progressive undertakings of both large and small central-station systems. The central-station industry has up to the late war made steady and remarkable progress. Most of the companies are determined to resume this progress without delay so that this industry may continue to be in the lead as it has been in the past.

A MESSAGE OF APPRECIATION FROM THE FRONT.

Interesting Letter from a Subscriber Showing How the "Electrical Review" Served the Boys Overseas.

I take this privilege in writing to express my sincere thanks for the past issues (since June 27, 1917) of the ELECTRICAL REVIEW.

It is needless to state they were very gratefully received and have passed many a dreary hour for both me and my comrades.

If paper could talk, many are the hair-raising incidents that some of those issues could relate.

Have received the issues regularly, while in the Toul sector in the St. Mihiel salient and while in the Argonne.

Arrived in France in June, 1918, going immediately into the lines in the Toul sector.

Received my training at Camp Gordon, Ga., where men from every state in the Union made up the 307th Signal Battalion. Our major is K. D. Schaffer, former district plant chief for the Bell Telephone Co., Toledo, Ohio. Such men, including its enlisted personal employes of the Bell Telephone Co. and Western Union Telegraph Co., composed our battalion, considered from its achievements one of the best in the A. E. F.

We left the Toul sector to take up the right flank of the St. Mihiel salient, which was opposite Metz and could be plainly seen on a clear day.

During that drive our division (82nd) made a creditable showing. Sept. 22 found us in the Verdun sector, and on Oct. 5 we entered the lines again, remaining until Nov. 1 after 50% of our troops were either killed or wounded.

All this time I received the ELECTRICAL REVIEW and this week received the December number, which I now have before me.

Am at present located in Champlitte with Brigade Headquarters, having been stationed here since Dec. 1, maintaining telephone communication. However, we start overseas soon, and a happy bunch we will be.

Once back home, must find occupation and am undecided whether it will be telephone work or my old line of business—lighting and power.

France is open for much improvement in lighting.

Champlitte is very poorly lighted, having a power plant, hydroelectric operated, generating 110 volts direct current. The lines are very poorly constructed, bare copper, mostly No. 10 and No. 8, mounted on porcelain insulators on iron brackets fastened to buildings. Inside wiring is accomplished about in the same manner as our bell and annunciator wiring.

Not a night passes but some interruption of service occurs, due to some uncalled for reason.

The plant is owned by a Frenchman individually and from all appearance has made his fortune in francs, so does not give it his attention. However, this is the way things are run in general in France.

Many small villages are without electric light.

The Americans have wired several in this area—Maetz, Coublanc, Seffron and others.

It is difficult to state if this would be a promising land for some wideawake American electrically inclined. Am thinking it would.

Again thanking you for this privilege to write and subscription to the REVIEW for these many past months, I remain, Yours sincerely,

SERGT. E. J. ROSS,
307th Field Signal Battalion, Co., B, A. E. F.

Linking Science and Art in Lighting

Last* of Six Articles Dealing with Esthetic Interior Lighting—Appropriate Use of Chandelier and Bracket—Tendency Toward the Use of Other than Ceiling Fixtures — Future Possibilities

By M. LUCKIESH

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PART VI.—SOME MODERN TENDENCIES IN LIGHTING.

THERE is a general tendency in lighting toward a more extensive use of so-called indirect and semi-indirect lighting. Owing to the increasing brightness of light-sources, especially the more powerful ones, good lighting requires the concealment or shading of these sources. One of the chief virtues of natural lighting indoors is its diffusion and there is a tendency in artificial lighting to simulate this characteristic. This need for diffusing the light makes it necessary to sacrifice some of the artistic chandeliers and brackets of the past centuries when the light-sources were flames of relatively low brightness compared with modern sources of high brightness. Chandeliers and wall brackets, when properly located, may be equipped with frosted lamps of low wattage and if these are viewed against a light background, annoying glare is not usually experienced. However, it is generally safer to equip chandeliers with diffusing shades, and brackets, which are usually more exposed to the normal visual field, should be provided with dense opal glass shades as large as artistic considerations will permit.

In some types of interiors, chandeliers and wall brackets are more appropriate than any other style of fixture. In fact, we are often confronted with characterless semi-indirect bowls in rooms of period architecture in which they are quite conspicuously incongruous. There is a tendency on the part of illuminating engineers to abandon the chandeliers and brackets, but the artist will cling to these in their appropriate places. In fact, such fixtures have great value in certain types of interiors where the artistic aspect is prominent. But the artist must be convinced that diffusing shades can be applied to such fixtures without sacrificing any artistic value. In Fig. 1 both chandeliers and wall

*The first five of these articles appeared in the Electrical Review of Oct. 5, Nov. 2 and Dec. 7, 1918, and Jan. 4 and Feb. 1, 1919.

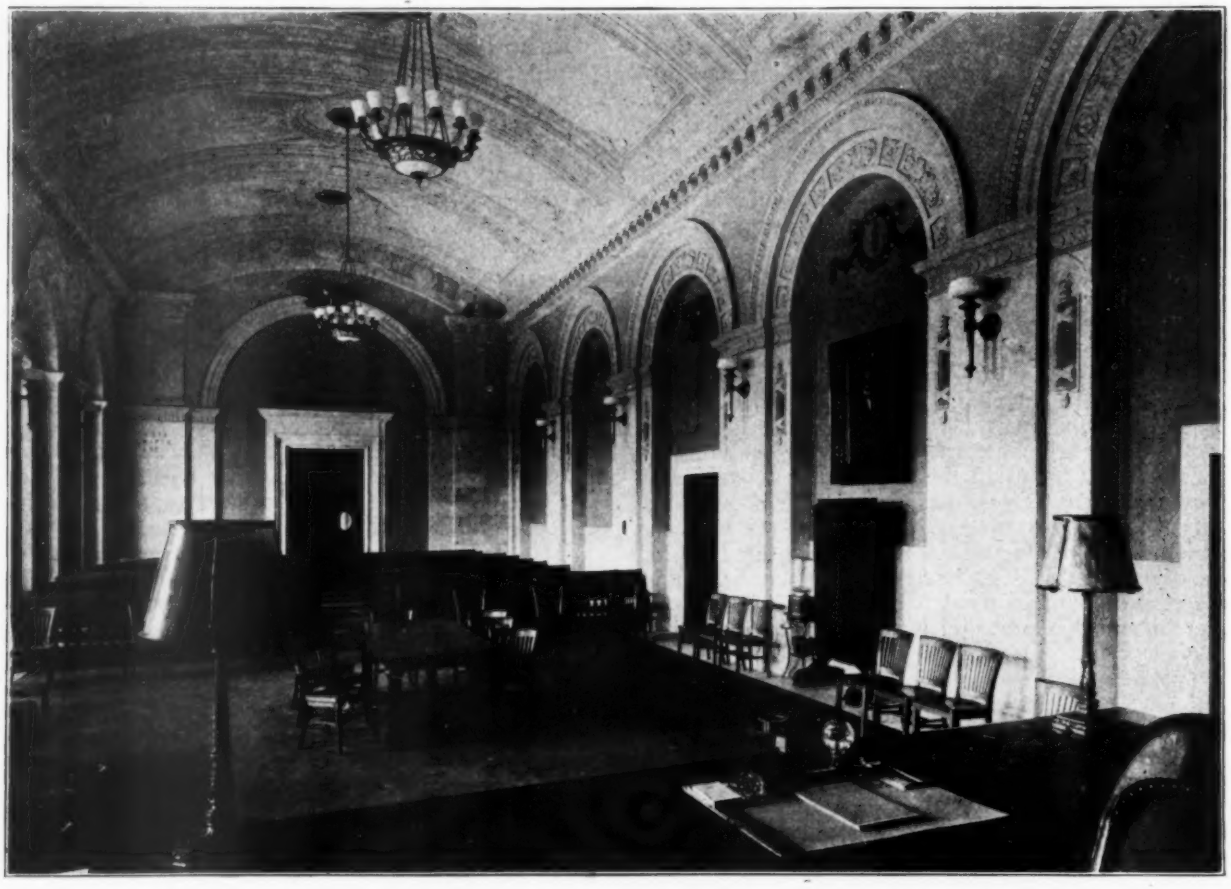


Fig. 1.—Court Room With Brackets and Chandeliers in Which the Lamps Are Well Shaded.

brackets are in use in a room in which both the utilitarian and esthetic aspects on the lighting are important. The small lamps in the chandeliers are shaded with dense opal shades. The wall brackets, which are lower and consequently are more commonly in the visual field, are equipped with large opal shades. This

Fig. 2.—Floor Lamps That Provide Both General and Localized Lighting in the Tea Room of a Hotel.

combination is quite satisfactory. This illustration is of a room in a large public building in which fixtures of these types are quite generally and satisfactorily in use. This type of lighting is not unique; in fact, it was perhaps the earliest used and it is mentioned here not to illustrate a modern tendency, but to bring forth the point that it still has a place in modern lighting. In fact, many possibilities are open to the designer of chandeliers, brackets and similar fixtures to link science and art in the solution of the more complex problems which confront the lighting expert as the art of lighting advances.

Lighting Must Be Appropriate.

There is an increasing tendency, especially in our large beautiful interiors, to conceal lamps behind cor-

Fig. 3.—Bank President's Office Artificially Lighted Through Skylight.

nices and in various recesses provided by the architect. Such schemes, if premeditated, make for a perfect blend between lighting effects and architectural design. Touches of color are all that remain to make lighting of this nature, when appropriate, of course, perfect from the standpoint of congruity. However, such highly diffused lighting is not always appropriate. For example, there is much dissatisfaction in some large dining rooms with this lighting which renders objects characterless. Jewels lose their charming glitter; human faces are not satisfactorily modelled, and there is no feeling of the slightest privacy. But these objections are not general, although they emphasize the importance of the law of appropriateness in lighting as in other activities.

These mistakes are excellent examples of a lack of imagination on the part of those responsible for the lighting and also illustrate the necessity of viewing lighting not only by itself but merely as one factor in the entire ensemble which comprises an interior and its function. Illustrations of this kind of "concealed" lighting and of the ordinary semi-indirect and indirect fixtures are to be found on every hand.

Examples of Lighting That Do Not Employ the Ordinary Ceiling Fixture.

It is the chief aim of this article to point out certain tendencies and possibilities in lighting in which the ordinary fixture suspended from the ceiling is not

Fig. 4.—Swimming Pool in Club House With Artificial Lighting Through Skylight.

used. In many interiors fixtures suspended from the ceiling detract from the artistic value of the room as a whole. In others inadequate provision has been made for appropriate lighting effects and it may be impracticable to provide the necessary wiring after the building has been completed. In Fig. 2 is illustrated a pleasing lighting effect obtained by means of floor lamps. By means of a simple mechanism containing a silvered reflector a powerful indirect component of light is obtained. Other sockets are available for the cozier direct component. Both of these effects are obtained from a single unit and it is seen that a degree of variety in the lighting effects is available.

Numerous noteworthy examples of artificial lighting through skylights in the ceiling are available. This method has been used in a number of art galleries and where science and art are properly linked the results are satisfactory. A number of hotels and other large interiors have employed this type of artificial lighting and in some cases beautiful color effects have been obtained. The scheme is especially practicable where the same skylight admits natural daylight. However, the maintenance of skylights is a matter of prime im-

portance and by no means inexpensive. In a number of cases artificial lighting has been done through specially designed windows in the side walls, but this is not generally good practice because the position of such windows is usually unsatisfactory from the standpoint of good lighting. However, such unique departures from general practice are the best solutions of some problems.

In Fig. 3 is shown a private office lighted by means of artificial light projected through the sub-skylight shown. In Fig. 4 is shown the same kind of lighting for a swimming pool. In both these instances the skylights admit natural light in the daytime. In the former case if the so-called artificial daylight tungsten lamp (Mazda C-2) were used they could be turned on as daylight begins to fail with the result that the occupant would not experience the annoyance of the usual change from natural to artificial light. Ordinarily, when natural daylight fails, the artificial light is supplied and when it differs in distribution and color there is a period of annoyance, as is well known. As the lighting art progresses toward refinement such points as these will be more carefully considered.

Many artistic ornaments can be designed for the purpose of concealing lamps and eliminating the ceiling fixture when advisable. Among these the flower box has many possibilities. It may provide a pretty ornament, especially when it contains artificial flowers or when vines are draped over it. It may be supported on the wall, over capitals, on mantels or bookcases, and in many other places. The use of this type of unit is shown in Fig. 5. This is a small theater which is quite satisfactorily lighted in this manner. Reflectors giving an asymmetrical distribution should generally be used when the boxes are supported on a wall or near it. In this case the brightest areas in the room are as far from the direct field of view as possible.

In Fig. 6 is shown a type of floor fixture which has been used successfully in numerous interiors for indirect lighting effects.

Almost Limitless Possibilities Ahead.

The possibilities of fixture design and architectural design appear to be limited only by the expenditure the consumer will authorize. They are certainly unlimited when considered from such viewpoints as opportunity and ingenuity. When we look backward over the accomplishments in the past ten years our imagination fails us in striving for a view ten years hence. High-efficiency lamps are available so that we need not handle light as we did in past years when it was so precious. We can alter it in color to suit our esthetic taste and the psychological requirements. Efficient reflecting, refracting and diffusing devices are available and great strides have been made toward accumulating knowledge in this direction. Much remains to be learned and to be done but it appears that progress demands a closer linking of the scientific and the artistic aspects of lighting.

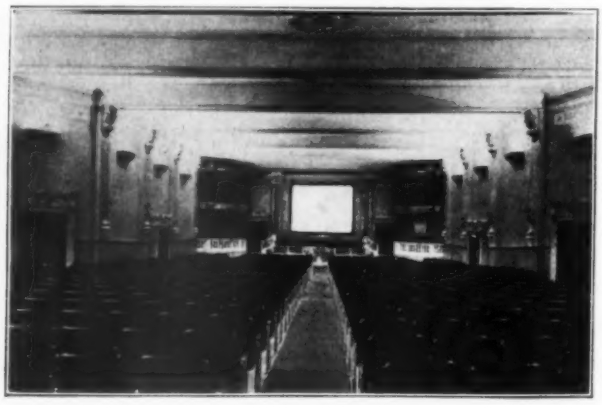


Fig. 5.—The Flower Box as a Place of Concealment for the Lamps in a Small Theater.

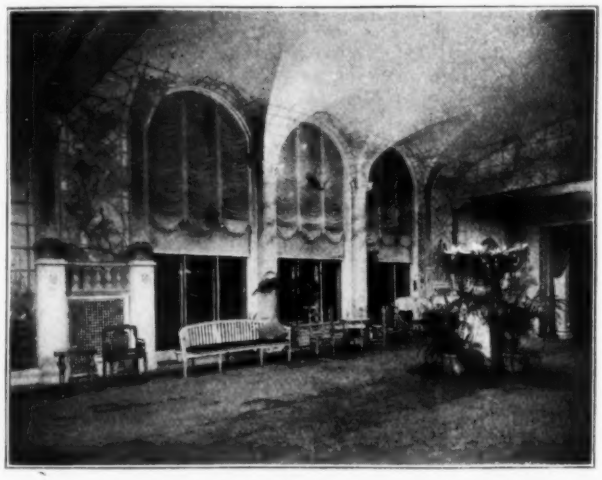


Fig. 6.—The Massive Flower Urn Solves Some Lighting Problems Very Well, as in This Club-House Foyer.

MARKED PROGRESS OF OKLAHOMA CENTRAL STATIONS FOR 1917.

The Oklahoma central stations show large increases in substantially all items for both five-year periods covered by the table, but in the increases from 1912 to 1917 are in most cases proportionally less than those for the preceding years. Although steam supplied the greater part of the horsepower in 1917, the figures show a very great proportional gain in the power derived from internal-combustion engines—from 200 hp. in 1907 to 5966 in 1912 and to 12,860 in 1917.

The figures are shown in detail herewith.

CENTRAL-STATION STATISTICS FOR OKLAHOMA.

	1917.	1912.	1907.	Per cent of increase.[1] 1907 to 1912	1912 to 1917.
Number of establishments	201	130	72	179.2	54.6
Commercial	95	67	58	63.8	41.8
Municipal	106	63	14	657.1	68.3
Income[2]	$4,306,782	$2,357,950	$1,106,316	289.3	82.6
Electric service	$1,212,933	$2,287,329	$1,097,134	284.0	84.2
All other	$ 93,849	$ 70,621	$ 9,182	922.1	32.9
Total expenses, including salaries and wages	$3,541,443	$1,888,706	$1,025,702	245.3	87.5
Number of persons employed	1,112	785	414	168.6	41.6
Salaries and wages	$ 885,880	$ 581,580	$ 264,604	234.8	52.3
Total hp.	80,997	53,922	22,623	258.0	50.2
Steam engines:					
Number	223	194	113	97.3	14.9
Hp.	66,769	45,821	22,423	197.8	45.7
Internal-combustion engines:					
Number	133	38	2	6550.0	250.0
Hp.	12,860	5,966	200	6330.0	115.6
Water wheels:					
Number	5	7	.....	.....	—28.6
Hp.	1,368	2,135	.....	.....	—35.9
Kilowatt capacity of dynamos	57,783	38,301	15,499	272.8	50.9
Output of stations, kw-hr.	100,737,632	48,824,097	24,985,903	303.2	106.3
Stationary motors served:					
Number	6,375	3,470	1,086	487.0	83.7
Hp.	61,268	23,056	6,586	830.3	165.7
Number of street lamps:					
Arc	1,925	3,303	[3].....	.....	—41.7
Incandescent, etc.	13,763	8,334	[3].....	.....	65.1

[1]A minus sign (—) denotes decrease. [2]Exclusive of $11,669 in 1917 and $130,096 in 1912, reported by street and electric railway companies as income from sale of electric current. [3]Not available.

Estimating the Wiring of Existing Buildings on Outlet Basis

Table Compiled by Commonwealth Edison Company Offers Complete Information on This Method—Advantages to Electrical Contractors—Method of Application

MANY electrical contractors, estimators and electricians have for years advocated the use of the outlet method for estimating the wiring of residences, flats and store and flat buildings, particularly in wiring such buildings after they have been built, or what is commonly known as old wiring. Unquestionably the easiest, simplest and most rapid method, it has heretofore been condemned because of the fact that sufficient data was not available and its use without such data entailed a certain factor of chance which was altogether too large to be consistent with efficient and accurate estimating.

By this method the cost of the wiring is determined from the number and types of the outlets to be installed and their locations. As the material and labor required varies but little in the same types of buildings of this character the principle difficulties involved are the segregating of the different types and the preparing of unit prices for them based on the results obtained from actual installations. This has been attempted many times, but due either to a lack of a sufficient number of the various types of buildings or enough styles of outlets very little headway has been made.

The table shown in Fig. 1, contains considerable information for contractors and others who desire to compile such data for their own use and in addition is a very practical method of listing the various items. The figures represent percentages taken from a table which was developed and is being used by the Commonwealth Edison Co., of Chicago. In this table 100% represents the cost of labor and material neces-

	Description of Building.	Ceiling outlet.	Wall outlet.	Baseboard outlet.	Push-switch and plug outlet.	Single pole switch outlet.	3-way switch outlet.	Service 1st meter and 1st circuit.	2nd circuit, 17 to 32 lights	3rd circuit, 33 to 48 lights.	Each addl. meter with 1st circuit.	1st addl. circuit on 1 meter only.	Oher addl. circuits.	Store wiring, addl. charge.	Hall outlet.
	One-story Residence—														
1	Open attic, unfinished, or no basement	27.5	29.0	38.0	40.0	32.0	35.9	100.0	48	20	....	....	....	.....	....
2	With finished rooms in basement	30.0	32.0	38.0	40.0	32.0	35.9	100.0	48	20	....	....	....	.....	....
3	Flat roof—with or without basement	30.0	32.0	38.0	40.0	32.0	35.9	91.8	48	20	....	....	....	.....	....
	One-story Flat Building—														
4	Open attic—With or without basement	27.5	29.0	38.0	40.0	32.0	35.9	100.0	....	....	20	48	20	80	....
5	With finished rooms in basement	30.0	32.0	38.0	40.0	32.0	35.9	100.0	....	....	20	48	20	80	....
6	Flat roof—With or without basement	30.0	32.0	38.0	40.0	32.0	35.9	91.8	....	....	20	48	20	80	....
7	With finished rooms in basement	32.0	34.0	40.0	41.8	32.0	35.9	91.8	....	....	20	48	20	80	....
	One and One-half-story Residence—														
8	With or without basement	30.0	32.0	38.0	40.0	32.0	35.9	100.0	48	20	....	....	....	.....	....
	One and One-half-story Flat Building—														
9	With open basement	30.0	32.0	38.0	40.0	32.0	35.9	100.0	....	....	20	48	20	80	....
10	With basement as separate flat	32.0	34.0	40.0	41.8	32.0	35.9	100.0	....	....	20	48	20	80	....
	Two-story Single or Double Flat Building—														
11	Flat roof—Open basement	32.0	34.0	40.0	41.8	32.0	35.9	120.0	....	....	20	48	20	88	....
12	Flat roof—No basement or flat in basement	34.0	35.9	41.8	43.8	32.0	45.9	120.0	....	....	20	48	20	112	....
13	Peak roof—No basement or flat in basement	32.0	34.0	40.0	41.8	32.0	35.9	120.0	....	....	20	48	20	112	....
14	Peak roof—Open basement	30.0	32.0	38.0	40.0	32.0	35.9	120.0	....	....	20	48	20	88	....
	Two-story Residence—Flat Roof—														
15	Open basement	34.0	35.9	41.8	40.0	35.9	35.9	100.0	48	20	....	....	....	.....	....
16	No basement or finished rooms in basement	35.9	38.0	40.0	46.0	35.9	35.9	100.0	48	20	....	....	....	.....	....
	Two-story Residence—Peak Roof—														
17	With open basement	30.0	32.0	38.0	40.0	35.9	35.9	100.0	48	20	....	....	....	.....	....
18	No basement or finished rooms in basement	32.0	34.0	40.0	41.8	35.9	35.9	100.0	48	20	....	....	....	.....	....
	Two and One-half-story Residence—														
19	With rooms in basement	34.8	37.0	42.8	44.8	35.9	35.9	100.0	48	20	....	....	....	.....	....
20	With open basement	32.0	34.0	40.0	41.8	35.9	35.9	100.0	48	20	....	....	....	.....	....
	Two and One-half-story Single or Double Flat Bldg.—														
21	With open basement	32.0	37.0	42.8	44.8	35.9	35.9	120.0	....	....	20	48	20	88	....
22	With finished rooms in basement	34.8	37.0	42.8	44.8	35.9	35.9	120.0	....	....	20	48	20	112	....
	Three-story Single or Double Flat Building—								....	....	20	48	20	88	43.8
23	Flat roof—Open basement	34.8	37.0	41.8	43.8	35.9	35.9	136.0	....	....	20	48	20	112	43.8
24	Flat roof—No basement or flat in basement	37.0	38.6	43.8	46.0	35.9	35.9	136.0	....	....	20	48	20	112	43.8
25	Peak roof—No basement or flat in basement	35.9	38.0	43.8	46.0	35.9	35.9	136.0	....	....	20	48	20	88	43.8
26	Peak roof—Open basement	34.2	35.9	41.8	43.8	35.9	35.9	136.0							
27	Three-story residence	41.8	48.2	51.9	46.0	43.8	40.0	100.0	48	20	....	....	....	.....	....
28	Four-story residence	43.8	50.2	51.9	46.0	43.8	40.0	100.0	48	20	....	....	....	.....	....
	Four-story Single or Double Flat Building—														
29	With open basement	37.0	38.6	43.8	46.0	35.9	35.9	136.0	....	....	20	48	20	88	43.8
30	With flat in basement	38.6	40.7	46.0	48.0	35.9	35.9	136.0	....	....	20	48	20	112	43.8

31 Wiring first flat only, add 35 cents per outlet.
32 Wiring first flat only, add 50 cents per outlet.
33 Wiring basement flat only, add 50 cents per outlet.
34 Wiring flat between two flats, add 50 cents per outlet.
35 Wiring top flat in three-story building, use three-story schedule plus 35 cents per outlet.
36 Wiring second flat in three-story building, use three-story schedule plus 50 cents per outlet.
37 Wiring first flat in three-story building, use two-story schedule plus 50 cents per outlet.
38 Wiring second flat in four-story building, use three-story schedule plus 50 cents per outlet.
39 Wiring third flat in four-story building, use four-story schedule plus 50 cents per outlet.
40 Wiring first flat in four-story building, use two-story schedule plus 50 cents per outlet.
41 Wiring fourth flat in four-story building, use four-story schedule plus 35 cents per outlet.

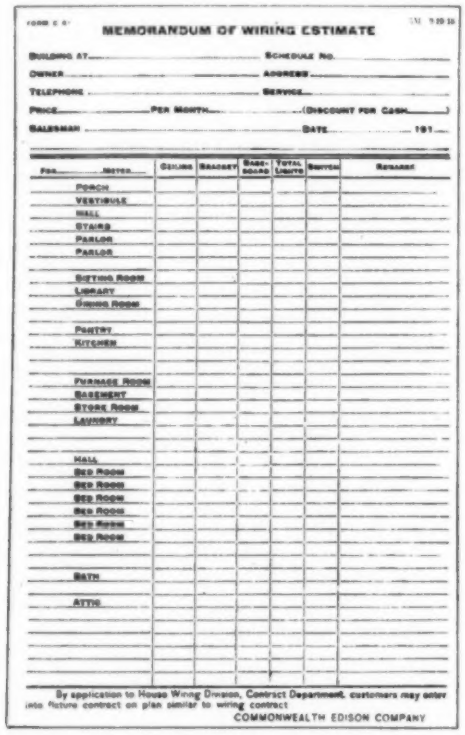
Basement and public hall lights on regular schedule.
Wiring garage additional to house meter, two outlets, one switch and 15 ft. of extension cord, $28.75. Additional outlets, $3.
Service extension on outside of building, 35 cents per running foot, capacity up to 100 lights.
Overhead lawn service, first 20 ft., $5.15; 9 cents per ft. for additional.

FIG. 1. TABLE OF PERCENTAGE COSTS OF OUTLETS IN VARIOUS TYPES OF BUILDINGS BASED UPON SERVICE INSTALLATION COST.

sary to install 20 ft. of ½-in. service conduit and wire, service switch and cabinet, approved meter equipment and the necessary fuse protection for one circuit. From this cost are taken relative percentages representing the costs of the various other items.

As this service or 100% cost provides for a more elaborate and expensive service installation than is the practice in the majority of places and as the outlet installations in these places will not vary but slightly in these respects it follows, of course, that their relative percentage will not be the same. However, the difference in costs for the different styles of outlets and circuit requirements in the various types of buildings should be practically the same under all conditions and once a contractor has established a definite cost for a certain style outlet in one type of building he may easily determine the costs for other buildings by applying the difference in percentages as shown in the table.

In this table the different types of buildings are segregated into 30 sections or schedules with 11 extra schedules to be used in unusual conditions. The outlets are divided into 8 different styles and locations to which may be added extra charges for additional meters and circuits. While the vast majority of buildings of this character are of approximately the same size and will require about the same quantity of material for each type of building, larger than ordinary size are taken care of by the ¾ watt per square foot or 880 sq. ft. per circuit ruling which is enforced in Chicago. According to this ruling such buildings require additional circuit capacity and the extra amount of material required is compensated for by the added circuit charge. Although this ruling is not enforced in many places it is nevertheless a good one to adopt for it insures the installation of sufficient circuit capacity to provide adequate lighting under all ordinary conditions.



MEMORANDUM OF WIRING ESTIMATE

BUILDING AT ..... SCHEDULE NO. .....

OWNER ..... ADDRESS .....

TELEPHONE ..... SERVICE .....

PRICE ..... PER MONTH ..... (DISCOUNT FOR CASH .....)

SALESMAN ..... DATE ..... 191 ....

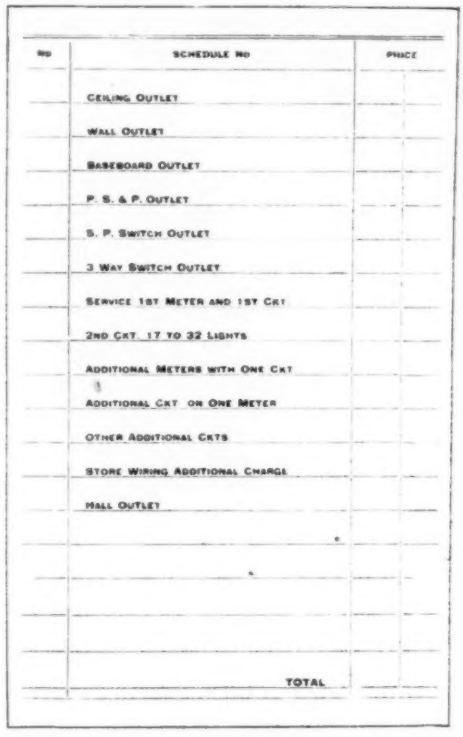
FOR ..... METER	CEILING	BRACKET	BASE-BOARD	TOTAL LIGHTS	SWITCH	REMARKS
PORCH						
VESTIBULE						
HALL						
STAIRS						
PARLOR						
PARLOR						
DINING ROOM						
LIBRARY						
SEWING ROOM						
PANTRY						
KITCHEN						
FURNACE ROOM						
BASEMENT						
STORE ROOM						
LAUNDRY						
HALL						
BED ROOM						
BED ROOM						
BED ROOM						
BED ROOM						
BED ROOM						
BED ROOM						
BATH						
ATTIC						

By application to House Wiring Division, Contract Department, customers may enter into fixture contract on plan similar to wiring contract

COMMONWEALTH EDISON COMPANY

Fig. 2. Estimator's Form for Designating Schedule, Types and Styles of Outlets.

Such a table is particularly valuable at this time when many contractors rely upon the wiring of existing buildings for the greater portion of their work. The conditions usually encountered in securing such contracts are different from those encountered in the securing of new wiring installations. In the first place, in a large number of cases the contractor is



NO	SCHEDULE NO	PRICE
	CEILING OUTLET	
	WALL OUTLET	
	BASEBOARD OUTLET	
	P. S. & P. OUTLET	
	S. P. SWITCH OUTLET	
	3 WAY SWITCH OUTLET	
	SERVICE 1ST METER AND 1ST CKT	
	2ND CKT 17 TO 32 LIGHTS	
	ADDITIONAL METERS WITH ONE CKT	
	ADDITIONAL CKT ON ONE METER	
	OTHER ADDITIONAL CKTS	
	STORE WIRING ADDITIONAL CHARGE	
	HALL OUTLET	
	TOTAL	

Fig. 3. Form Used for Totaling Prices of Wiring Estimate.

not bidding in competition with another contractor, but the main difficulty is found in persuading the customer to have the building wired. Secondly, the number of possible customers is much larger. It therefore follows that the plan whereby the greatest number of estimates may be made at the least expense is especially valuable as the proportions of such jobs, estimated to the houses actually wired is very small, probably smaller than the average obtained by a single contractor in wiring new buildings.

It is not claimed that this method is as accurate or efficient as the method by which the estimator actually measures the amount of material required and estimates the labor necessary to install it at the same time, thereby eliminating an extra trip to the building to order the necessary material after the job has been secured. The results obtained by the Commonwealth Edison Co., however, have shown that the difference between the estimated and actual costs average around 3% and the greater number of estimates which a man is able to make amply repay for the extra trip required to order material.

Methods of Application.

The methods used by this company in applying this system and securing the contracts are also worthy of note. The estimator, when the original call is made, fills out the "Memorandum of Wiring Estimate" shown in *Fig. 2*. At the top of this form spaces are provided for special information concerning the location of the building, etc., and also the schedule

number which corresponds to the number opposite the same type of building on the table. Below are spaces for filling in the number and styles of outlets desired in the various rooms of the building. This form completely filled out is then turned in to the office.

In the office the outlets, etc., are totaled and the costs as shown on the chart applied on the opposite side of the form as shown in *Fig. 3*. For example, let us assume that the building to be wired is a 2-flat building, five rooms in each flat, with a flat roof and open basement. Buildings of this type, according to the table are figured on Schedule No. 11. Ordinarily such a building will require about 18 ceiling outlets, 6 wall outlets, 6 baseboard outlets, 6 single-pole and 2 3-way switches and two meters with two circuits for each meter.

For convenience, assume $10 to be the cost of the unit or 100% service. The wiring estimate for such a building may be easily totaled as follows:

SCHEDULE No. 11.

18 ceiling outlets at 32% of $10 or $3.20	$ 57.60
6 wall outlets at 34% or $3.40	20.40
6 baseboard outlets at 40% or $4.00	24.00
6 single-pole switches at 32% or $3.20	19.20
2 3-way switches at 35.9% or $3.59	7.18
Service 1st meter and 1st circuit at 120%	12.00
2nd circuit at 48%	4.80
Additional meter and 1st circuit at 20%	2.00
Additional circuit on 2nd meter at 20%	2.00
Total bid for wiring	$149.18

This price, to which has been added the necessary overhead and profit percentages, and the number of outlets, etc., are then transferred to the proposition which is to be submitted to the customer. This proposition which, properly signed, constitutes the contract between the company and the customer, reads substantially as follows:

WIRING ONLY.

SCHEDULE .....

Dear Sir:

We hereby propose to furnish labor and material necessary to install wiring and switches in the .... story ..... residence, Apartment Building, owned by you at No. ...., Chicago.

The work to be done under this contract will consist of wiring ..... outlets for ..... lights; ..... outlets for single or double pole switches; and ..... outlets for 3-way switches, as follows:

LIGHT OUTLETS.

Meter.	Ceil.	Bracket	Basebrd.	Total Lights	Switches
Porch					
Vestibule					
Hall					
Stairs					
Parlor					
Back Parlor					
Sitting Room					
Library					
Dining Room					
Butler's Pantry					
Kitchen					
Furnace Room					
Basement					
Store Room					
Laundry					
Upper Hall					
Bed Room					
Bed Room					
Bed Room					
Bed Room					
Bed Room					
Bed Room					
Bed Room					
Bath					
Attic					

REAR—OVERHEAD Extension
Service ONLY to be FRONT-UNDERGROUND Ordered

The total price of the above work, complete as specified, is .....Dollars ($.....), and we agree to accept payment of said sum of $..... in equal consecutive monthly instalments of $..... each, the first instalment to be paid on the signing of this contract and the remaining instalments to be paid on the first day of each and every month thereafter until fully paid.

A discount of 10% will be allowed if payment is made in full on signing contract, or 6% if paid upon completion of work.

All wiring above basement will be concealed in flexible metallic conduit and armored cable and exposed rigid conduit on basement ceiling unless otherwise specified.

We will do all necessary cutting of floors and plaster, and will repair the floors, leaving them in good condition, but it is understood that all patching of plaster and all retouching of decorations is to be done by you at your expense.

All work will be done in a neat and workmanlike manner, in strict accordance with the rules and requirements of the Department of Electricity of the City of Chicago, and the City's Preliminary Certificate of Inspection will be guaranteed by us and the fee for the final inspection will be paid by us, but the City Electrical Inspection Department will not issue final Certificate of Inspection until the fixtures are installed and approved.

This proposal, although signed, is subject to the approval of our General Contract Agent, and, if accepted, shall not be binding upon the Company until endorsed with his approval.

COMMONWEALTH EDISON COMPANY,

..... Salesman.

By .....
Head Lighting Agent.

To Commonwealth Edison Company:

Your proposal, as above, is accepted by me / us this day of ..... 191... I / We hereby represent that I am / We are the owner of the above mentioned premises, and that the title to same stands in my / our name.

.....
.....
.....
.....

Approved ..... 191..

COMMONWEALTH EDISON COMPANY,

By .....

General Contract Agent.

This proposal is accompanied by a letter of instruction and explanation which explains the correct procedure in signing and an explanation of the various items listed. On the opposite side of the proposal form space is provided for further information such as credit information, etc., which the customer is required to fill in for the information of the company.

Another form is also provided to be used where the customer desires the company to furnish and install the fixtures. This form is similar to the proposal form except that the various items refer to fixtures in place of outlets and places are provided for designating the style of glassware and other fixture features.

After the proposal has been accepted and returned to the company it is turned over to the Construction Department, which department estimates and orders the material and has direct supervision over the installation of the work.

Marked advance has taken place within the last two years in the application of vacuum-tube amplifiers based on the Fleming valve and audion. They are being used in signaling and communication circuits for successfully amplifying such feeble currents as have baffled the ingenuity of inventors heretofore.

NEW STEEL PLANT UNDER CONSTRUCTION AT PORTLAND.

Electric Cranes and Motor-Operated Rolls and Other Machines Are Features—Large Structural Steel Buildings.

One of the most important new enterprises at Portland, Ore., is the construction and equipment of the new plant of the Pacific Coast Steel Co., at Willbridge, a suburb of that city. The site comprises a 30-acre tract lying between the Portland-Linton highway and Willamette river, one part of it being traversed by the Spokane, Portland & Seattle Railroad. The company has a dock on the river, affording facilities for water transportation.

The new plant will have the capacity for producing 200 tons of commercial steel per day from scrap steel, basic iron, ferro-manganese and other products, some of which will be received from the company's large plant at Youngstown, Seattle, Wash.

The two main buildings being erected are of structural steel, the foundations for which consist of reinforced-concrete piers extending to a depth of 12 ft. below the surface. The construction work requires 600 tons of structural steel and 1700 cu. yds. of concrete.

The open-hearth furnace building, to contain two modern, 50-ton, oil-burning furnaces, of the Alexander Laughlin open-hearth type, is 147 ft. long, 105 ft. wide, and will be served by two electric cranes of 60 tons and 5 tons capacity, respectively, for handling the ladles and setting the ingot molds. The rolling mill building, 320 ft. long, 88 ft. wide, and covered with corrugated, galvanized iron sheets, is to be served by a 15-ton electric crane, of 84-ft. span and a 400-ft. runway. Between the two buildings just described is the ingot yard, served by an electric traveling crane having a 54-ft. span and a 440-ft. runway. This crane is supported by steel girders extending from the mill building to the furnace building. All cranes are operated by 220-volt, direct-current motors.

Electrical energy is to be utilized for all power purposes, for which there will be a connected load of 1600 hp. The transformers, of General Electric type, being supplied by the Portland Railway, Light & Power Co., consist of three 500-kva., 11,000/2300-volt, three-phase, 60-cycle; three 150-kva. single-phase, 11,000/440-volt, and two 50-kva., single-phase, 60-cycle, 11,000/110-volt, the last named being for lighting circuits. Three-phase energy at 11,000 volts will be received from the Portland Railway, Light & Power Co. system. Included in the equipment will be a 75-kw. motor-generator set for producing direct-current energy for the crane motors and probably some others. The twenty or more motors for main drive in the two buildings will be three-phase motors. The largest of these will be a General Electric 800-hp., 2200-volt, mill-type motor for operating a three-stand 14-in. and a seven-stand 10-inch rolling mill. Power is to be transmitted by rope drive to the 14-in. mill and by flexible coupling to the 10-in. mill. All other motors are Westinghouse manufacture, the other motor-driven machines consisting of a crusher for lime rock and magnesite, charging apparatus for the furnaces, roller tables, hot-bed mechanism, conveyors, air compressors, blowers for furnaces, oil and water pumps. In some of these operations variable-speed motors are required, and in others, such as furnace charging, the motor will be controlled by contactors and time-element relays.

These data relate to the original plans made prior to the close of the war, and while the installations in the furnace building doubtless will be carried out as originally designed, the equipment in the rolling-mill building may be subject to some changes to meet the needs and demands of after-war conditions.

The 60-ton electric crane, above mentioned, is being supplied by the Morgan Engineering Co., Alliance, Ohio, and the other three by the Champion Engineering Co., Canton, Ohio. Another feature is a 10-ton steam locomotive for yard work, and also for pushing the cars carrying the charging cradles up to the front of the open-hearth, the cradles then being taken up by the electrically operated charging machines and the contents fed into the furnaces.

Reverting to the subject of construction work, it should be noted that three reinforced concrete stacks are being built—one for each of the open-hearth furnaces, and one for a heating furnace. Each stack is lined with fire-brick and has an inside diameter of 4 ft. 7 in. The height is 125 ft. above the ground surface, with a base extending 12 ft. below it. A water system and sewer system have been put in, and a 30,000-gal. oil tank of reinforced concrete and a pump house are being built. The oil tank is set below grade level. Camden suction pumps are being installed for handling the fuel oil, and centrifugal pumps for water.

The construction and installation work is in charge of C. P. Burgess, general superintendent, and W. C. Eshelman, construction engineer for the company. The concrete and steel construction is being done under contract by Grant Smith & Co., Portland and Seattle.

ELECTRICAL EXPORTS FROM NEW YORK.

From the statistics now available, it is interesting to note the exports of electrical goods from the Port of New York during the month of December. Among these are batteries, of which a total of $94,970 was shipped, Norway receiving $26,881 of this allotment, Chili, $3695, and New Zealand, $5228; dynamos, totaling $269,535, of which $21,900 was for Denmark, $100,972 for France, and $5009 for Cuba; insulated wire and cables, totaling $344,601—Spain receiving $88,944, Brazil, $14,970, and France, $11,017; magnetos, totaling $267,112—England receiving $91,079, Italy, $77,687, and France, $18,171; switches and accessories totaling $105,300—$19,723 going to Spain, $15,162 to France, and $8916 to England; transformers totaling $122,888—an aggregate of $18,239 being shipped to France, $13,605 to Spain, and $13,116 to Chili; boilers aggregating $93,616, a total of $37,066 going to Chili, $7000 to France, and $2000 to Bermuda.

RESULT OF OPERATING ECONOMIES AT BINGHAMTON.

As a direct result of improved operating methods, made possible by the installation of new generating equipment, the Binghamton (N. Y.) Light, Heat & Power Co., during last January generated 161,076 kw-hrs. more than during January of 1918 on 493 less tons of coal.

In January, 1918, this company generated 1,128,834 kw.-hrs.; in January, 1919, it generated 1,289,910. In January, 1918, 2,000 tons of coal were used; in January, 1919, 1,507 tons were used. The revenue in January, 1918, was $35,241.25; in January, 1919, $40,060.00. In the month of November, 1918, pounds of coal per kilowatt-hour were 2.36.

Editorial Comment

An Awakening in the Central-Station Industry

IN order to obtain first-hand information regarding new extensions and other construction work to be undertaken by central-station companies this spring, the ELECTRICAL REVIEW directed a letter of inquiry to approximately 2500 companies. Elsewhere in this issue we summarize the replies so far received. Attention is also called to the department of construction items where specific details are given of considerable new work that will be undertaken by utility companies immediately.

The outstanding feature of this survey is that the central-station industry as a whole will do a considerable amount of new work this spring and summer—not only to take care of normal increases but in anticipation of an appreciable amount of new business. It is true that in some respects the actual amount of contemplated work is not as extensive as in previous years but when conditions are taken into consideration it is certainly encouraging that even as much will be done as is already planned.

The fact that there is considerable apprehension in some localities with reference to a decline in prices and the unprecedentedly high wage scale has undoubtedly led some companies to report that little or nothing will be done unless conditions improve. Nevertheless enough far-seeing companies have made plans to go ahead to make it safe to predict that 1919 will maintain the high average of the past few years previous to our entering the war.

One of the splendid accomplishments of the war period was the manner in which the central stations in the war-industries cities met the sudden loads of munition plants, shipyards, cantonments, etc. With equal fine spirit many other central stations are now preparing to meet the renewed peace loads of other cities.

Fundamentally, business conditions in the central-station industry are exceptionally sound, and it is generally conceded that an era of prosperity is ahead. What is needed, however, is greater optimism and faith, not only among central stations but all branches of the industry. Prosperity and depression are both conditions of the mind as much as anything else. The forthcoming convention of the National Electric Light Association, which is being planned on a pre-war basis, will do a great deal towards bolstering up spirit in the industry. Manufacturers particularly should give their support to a movement to reduce the period of uncertainty and shorten the reconstruction era by starting an active campaign to overcome it.

Improving Central-Station Plant

IN THE survey of the central-station industry made by the ELECTRICAL REVIEW a rather astonishing fact has been brought to light. With the coming of spring with its milder weather, lessening of loads and general awakening of the year has always come spring activity in the way of construction, improvements, extensions and rehabilitation. In the past this has consisted very largely of outdoor activity, changing of insulators, renewal of crossarms, conductor reinforcing, line extensions and similar work. This year to an extent without precedent in our knowledge the spring activity centers around indoor work.

The reasons for this are, perhaps, not far to seek. The war, and the strenuous time preceding our entry into the conflict, curtailed development of additional loads not readily get-at-able. The three outstanding features of central-station operation during these times were fuel shortage, labor difficulties and a lack of capacity to meet demands made upon it. The result, naturally, is that much experience was gained and many lessons taught are now to be acted upon.

First and foremost there is the boiler room. And no one operating a boiler room during the last two years failed to learn many things; and if indications are correct, few will wait unnecessarily in putting their ideas into practice by applying their solutions to the many problems. These problems embrace such matters as coal handling and measuring, combustion improvement and economy, feed-water regulation and measurement, and steam-flow metering, reduction of the many preventable wastes, and all-round general rehabilitation. In many instances additional capacity is to be installed; in other cases it is to be obtained by supplanting natural by mechanical draft, hand firing by mechanical stoking, and equipping the boiler room with instruments wherewith what is going on and how it is being accomplished may be known.

In the generating stations and substations long-needed repairs and improvements are to be brought about. Equipment is to be rearranged for greater economy of operation and space, and greater ease of operation. Old equipment is to be replaced by new, and in almost every instance hand control is being replaced by automatic. Voltage regulation—the criterion of central-station service—is receiving great attention. Many of the smaller utilities that not long ago would not consider automatic voltage regulation of their feeders are now turning to automatic regulation as a way to improve their service, increase their revenue, and accomplish quickly and scientifically and more completely results similar to re-enforcing line

conductors. The safety movement, that receives more consideration in times of peace than during the waging of war, is apparent in many of the reported improvements to be made.

All in all, the construction, the improvement and rehabilitation work now planned for indoors shows conclusively that lessons taught by the war are to be put to good purpose. Economy of operation and materials, safety and reliability without sacrifice of flexibility, simplicity of layout and well-laid plans, mark central-station activity. Higher standards, higher ideals and the promise of greater loads generally indicate that the central stations are preparing to make up for lost time.

Tendencies in Esthetic Lighting

GREAT advances in lighting practice have resulted from the development of efficient lamps and accessories. This higher efficiency has been accompanied unavoidably by higher brilliancy of light sources, which necessitated sacrificing part of the efficiency in order to secure better diffusion. This resulted in the production of not only numerous types of diffusing shades and globes, but in such radical departures from former lighting practice as the use of indirect and semi-indirect lighting and variations thereof. When correctly applied not only have these presented some excellent solutions of the serious question of glare, but they have also offered many novel and beautiful examples of interior lighting. Thus they have served to give greater variety and scope to the designer of the lighting for public buildings, theaters, hotels, club houses, schools, libraries, art galleries, the better classes of stores, offices and residences, and other buildings in which considerable attention is given to esthetic results in the general architectural design.

A decided impetus was thus given to indirect lighting systems. Their rapid advance within the last dozen years aroused very spirited discussion which has not yet entirely terminated. One group of lighting men heralded this advent with almost unbounded enthusiasm while the opposing group looked upon the development as freakish and regarded it with scorn. Between these opposing groups the preponderance of lighting interests have looked upon indirect lighting as possessing decided merits in very many cases. Its advantages are well known and its limitations also. A very excellent presentation of the status of the matter is given in the article by Mr. M. Luckiesh, which appears in another section of this issue. He points out that, contrary to the belief of some lighting men, direct lighting still has its distinct field in places where consideration to esthetic effects is necessary or desirable. In many places insufficient attention has been given to making the lighting system appropriate to the uses of the room and the character of its architecture and general design. In some places, for instance, direct lighting fixtures of proper design can give a very pleasing and harmonious result. Such modifications of direct lighting as furnishing the light through an artificial skylight, while somewhat expensive, also produce very unique and satisfactory results.

The fact is that through development of the lighting art we now have available a much greater wealth of good lighting equipment than was conceived possible a few years ago. This has placed at our disposal facilities for producing unique lighting effects that may in many cases lend additional charm to the architectural design. How successfully this is done depends on the harmony between the lighting method employed and the general scheme of the architect. Blind choice of a pet lighting system may through incongruity entirely defeat the aim sought. From the variety of methods now available it should be possible to select a suitable combination.

Prejudice should not be a deciding factor in selection of what is to be used. The final result will indicate whether the visual requirements of lighting practice as well as good taste have been thought of. It is therefore evident that careful consideration must be given to all questions involved before deciding on what system of lighting is most appropriate.

The present article by Mr. Luckiesh is the last of his present series on "Linking Science and Art in Lighting." We feel sure that our readers will be pleased to know that Mr. Luckiesh has in preparation a new series of articles which will be a development of the ideas he has set forth and will serve to throw much new light on this subject that has up to the present time received too little candid, unbiased and sympathetic consideration.

A Central-Station Opportunity

THE unusually mild winter, which has established new records in many localities, has made certain a serious shortage of ice this summer. In fact, it is predicted that the retail price will be in the neighborhood of $1.00 per 100 pounds.

Naturally thoughts turn to artificial ice plants but when it is considered that in a city like Chicago, for instance, the existing plants can only take care of about two-thirds of the normal requirements, some idea can be had of the seriousness of the situation.

The supply of service to ice plants constitutes one of the most profitable loads for the central-station company and every effort should be made to encourage the extension of present plants and the establishment of new ones. Likewise, the operation of an ice-making plant as an adjunct to a central generating plant should again be given consideration.

The big opportunity for the central-station industry, however, is in the household motor-driven refrigerating machines that can be applied to any domestic ice box. There are several such machines on the market and opportunities for many more. Central-station sales departments should look into this field, which has such great potential possibilities.

Week's Events

A. I. E. E. Holds Successful Midwinter Convention—Effective Demonstration of Productive Lighting—Other News

FUTURE PROSPECTS DESCRIBED TO CENTRAL-STATION MEN.

E. W. Lloyd Addresses Edison Men on Growth of Industry.

At a meeting of the New Business Group of the Commonwealth Edison Co. held in Chicago, Feb. 24, E. W. Lloyd, general contract agent of the company, delivered an interesting address on "Getting Back to Normal Business." The members of this group, which comprises the contract, inspection and construction departments, are engaged in the securing of new business for the company and in the work which necessarily proceeds the connecting of new customers to the company's lines.

Mr. Lloyd was very optimistic about the future of the central-station industry and is of the opinion that a great opportunity still exists in this field for the ambitious salesman in spite of numerous assertions to the contrary. In proof of this he pointed out the many applications of electricity which have, through the extreme conditions of the war, become for the first time generally known and used to any extent. All of these applications present to the central-station companies possibilities for increased loads which were not recognized before and to the central-station employe an opportunity to become an expert in certain lines while the field is still unworked and to profit in the tremendous growth which is sure to follow.

Electric welding, for example, was given prominence for the first time during the war and the notable advances made in its application and the remarkable results which were achieved assure its widespread use in the future.

The use of electric furnaces has also been greatly advanced in this country since the outbreak of the war. In 1914 this country had fewer electric furnaces in operation than any of the larger countries of Europe; now it has more than any other, yet the greater part of the field has not been touched. Likewise, electrochemistry is only beginning to occupy the place it should among the industries of the country.

The growth of the use of electric power for refrigerating purposes and ice making has been remarkable, but this field still offers great possibilities for the central-station salesman. This is especially true this year for the extremely moderate winter has brought about a shortage in natural ice, which will increase the demand for electric service for large artificial ice plants and should bring about a more general use of small household electric refrigerating outfits.

In addition, the prospects in the electric vehicle, appliance, lighting and housewiring fields appear exceptionally bright. Improvements in design and the tendency towards better roads have increased the demand for electrically operated vehicles of all sorts. Appliances are more in demand due to the difficulty in securing domestic help. The advantages of adequate lighting facilities have only recently been definitely proven and are as yet not realized by the vast majority of manufacturers. And, in spite of the progress which has been made, there is still a large number of houses which are not wired. Mr. Lloyd estimated that at the rate the houses of Chicago were being wired, it would be very many years before this work was completed.

Looking further into the future, the electrification of the railroads and the use of electric power for heating appear as the greatest possibilities. The former has already proven successful and only the financial requirements prevent its application. The latter is steadily growing and may be expected to take a prominent place as a load builder on central-station lines in a very few years.

SERVING AND REGULATING ELECTRIC SUPPLY TO INDUSTRIAL LOADS.

Substations and Voltage Regulation Receive Attention of Ohio Electric Light Association Meeting.

The transmission and distribution committee of the Ohio Electric Light Association held a meeting in the Hotel Statler, Cleveland, Ohio, on February 20, at which was discussed the two important subjects of industrial substations and automatic voltage regulation of distributing circuits. The meeting was well attended, and a lively discussion took place, chairman R. R. Krammes, presiding.

The first paper, read by G. B. Schneeberger, electrical engineer, Cleveland Electric Illuminating Co., was entitled, "Industrial Power Substations." Mr. Schneeberger reviewed the evolution of the industrial substation as built by his company, illustrating his paper by lantern slides. When this type of substation first came into vogue, the installation was the simplest, usually consisting merely of an outhousing of corrugated iron in which the transformers were housed, and located wherever conditions permitted. Today, construction has become fairly well standardized, as also the conditions under which the cost of the substation is borne either by the utility or the customer. The present practice is to adhere wherever possible to brick construction. The arrangement of transformers and control apparatus has been standardized as far as possible, so as to assure safety to service and persons, and simplify installation.

The discussion centered around the question of construction methods, location of transformer valuts, methods of charging for energy and cost of the installation, ventilation, and transformer protection, when fuses and when circuit breakers are employed.

The second paper was read by Frank Hershey, General Electric Co., Schenectady, and was entitled "Automatic Voltage Regulation of Distributing Circuits." This paper discussed the necessity of uniform voltage, upon revenue, lamp efficiency and lamp life. It is the criterion of central-station service. The use of voltage regulators was advocated, and the method

of laying out territories for enabling voltage regulation to be carried on properly outlined. The cost of installing automatic voltage regulators was balanced against the cost of stringing additional copper conductors for certain cases, showing the superiority of regulators as regards not only cost but also efficiency and flexibility. The induction regulator is used almost exclusively at the present time, the survival of the fittest. Mr. Hershey outlined the application of the induction regulator to single and three-phase circuits, three and four-wire, using two and three regulators, with inter-connected current transformers.

In the discussion that followed, considerable interest was found to center round the three-phase four-wire system of distribution, because of its flexibility in permitting single- and three-phase loads to be served independently and the voltage of the single-phase lighting loads to be regulated without affecting materially the voltage of the three-phase loads. The use of line drop compensators or the compensated type of contact-making voltmeter, the methods of checking up the settings was another matter that brought out considerable discussion.

At the close of the discussion, followed by luncheon in the Electrical League's club rooms, inspection parties visited the new extension to the power plant at 70th street of the Cleveland Electric Illuminating Co., many of the industrial substations of the same company, and portions of this same company's underground system.

LIGHTING FOR PRODUCTION EFFECTIVELY DEMONSTRATED.

W. A. Durgin Discusses Lighting from Production Standpoint and Visually Demonstrates It by Cleverly Designed Model—Results of Lighting Survey and Tests.

A most unique lecture and demonstration entitled "Lighting for Production" was presented before a well attended meeting of the Chicago Section of the Illuminating Engineering Society on the evening of Feb. 20. Many factory owners and managers, contractors and architects were present as guests of the lighting men and in the course of an hour's demonstration and semi-technical discourse received a more vivid impression of what modern factory lighting signifies, what it accomplishes and how it is efficiently produced than could be obtained from countless hours of ordinary sales talk and possible desultory trial installations. The lecturer was W. A. Durgin, lighting assistant to the vice-president, Commonwealth Edison Co., Chicago, who will be remembered for his unique lecture on "Lighting as a By-Product or Buy-Product" before the 1916 N. E. L. A. convention.

Mr. Durgin referred in his introduction to some of the difficulties confronting the lighting man because of the necessity of meeting physiological and psychological conditions that vary considerably in individuals. By approaching the problem of industrial lighting in a human, practical way without overemphasis on illuminating engineering terms, but conforming strictly to the best lighting practice, much headway has been made in Chicago in factory lighting betterment by the central-station organization. Connected to the company's lines are some 700 large industrial concerns with motor installations of 100 hp. or more. During the past year inspectional surveys were made of 260 of these plants that aggregate a floor area of over 19,000,000 sq. ft. and employ 43,000 men. During the hours when work must be performed by artificial light, the average illumination intensity employed in these plants was found to be 1.4 ft.-cdls. The equipment in use comprised a varied aggregation of bare lamps and lamps with shades and reflectors of numerous types, mostly cheap in price and misfits, and usually very dirty.

A special model was used for the demonstrations. It consisted in the upper part of a section of a factory about 42 ft. wide to the scale of 1 in. per ft. In it were shown in proper place windows at the sides, work benches at the windows, small lathes and other machines in rooms parallel to the benches. Below this model was a large, square piece of ground glass representing the working plane of the benches and machines in rows parallel to the benches. Below projected from behind onto this glass surface so as to show simultaneously the relative intensity and distribution obtained with the various lighting systems shown in succession in the model proper. First, by means of daylight lamps just outside the windows but screened from the view of the audience, were shown characteristic light distributions and intensities obtained with natural light through the windows clean and then dirty; the effect of changing the sky angle was shown, also the nature of the shadow effects; the great contrast in intensity between the areas near the windows, and the middle portions of the room (25 and 0.6 ft.-cdls., respectively), was very strikingly demonstrated. Lighting a row of lamps over the middle improved this.

The still common method of using close to the work drop lamps bare and with cheap cone reflectors was displayed so that its meagerness in lighting only small areas of machines or benches and leaving the rest of the room in dense shadow was clearly shown. Mr. Durgin pointed out other serious disadvantages of such lighting and then contrasted them with the many advantages of general lighting that were at the same time effectively demonstrated on the model. Nine units were shown at a height corresponding to 10½ ft. above the floor; each was equipped with a modern steel reflector and gave an illumination intensity of 10 ft.-cdls. uniformly over the entire floor. Lack of uniformity was shown when the mounting height was lowered.

Mr. Durgin discussed the effect of well designed general lighting on reduction of accidents, improvement of supervision, making work rooms more orderly and cheerful, making the men more contented, and other factors that raise the morale of the entire organization. These benefits, while clearly noticed in every properly lighted shop, cannot be definitely reduced to specific figures. The commonly claimed increase of production should be capable of accurate determination, however, and to verify it the Commonwealth Edison Co. instituted a series of carefully conducted tests in four different Chicago factories.

The first test in an iron pulley finishing shop was made after an obsolete lighting system was replaced. The electrical consumption was increased 7 times, the average illumination 25 times; the testing engineer's records showed an increase in production of 20% at a cost of 5.5% of the payroll. In the second test, in a shop making soft metal bearings, the increase of production for different machining operations averaged 15% after the intensity was increased nearly to triple the original value. A third test was conducted in a machine shop working on heavy steel parts. Quadrupling the intensity gave an increased production averaging 10% at a cost of 1.2% of the payroll.

The fourth test was in a shop assembling carburetors; here the intensity was increased nearly 6 times and the production 12% at a cost of only 0.9% of the payroll. The details of these four interesting tests as Mr. Durgin presented them will be published in a later issue.

The need for education on the part of the contractor was shown in comparative estimates and lighting layouts prepared by a lighting specialist and several contractors. The cost of the installations made by the contractors was from 54 to 62% of that suggested by the lighting man and from 1¼ to 2½ times as many units were installed by them, but being of small size, the total wattage of the lamps was reduced from ½ to 1/7 of that the specialist thought necessary. At an average of 60% of the cost and ⅓ of the wattage, the customer received only 9% as much light, or for every dollar expended he got but 15% as much light as if the specialist's plan had been followed. The increased cost of good lighting in eight recent installations was 1 to 4 cents per employe per day. A saving of ¾ up to 4 or 5 min. per day because of the good lighting would offset this higher cost, but the actual saving was found to be from 45 min. to 2 hours per employe per day.

The low cost of productive-intensity lighting is due to the superior efficiency of the higher grade reflectors and the larger gas-filled lamps it employs. Mr. Durgin showed samples of modern high-efficiency lighting units for industrial plants and compared their general characteristics in a general way. The importance of minimizing both primary and secondary glare was strongly emphasized; the latter from highly polished surfaces on machines or work is often as troublesome as the former. Need for good maintenance was also pointed out. Mr. Durgin showed that in some cases the need for local lighting will still exist, in fact the entire problem of securing a satisfactory lighting system when special requirements are to be met is one that should be referred to the lighting specialist. Such a system, however, is a distinct economic benefit to all concerned.

ACOUSTICAL ENGINEERING EXPLAINED TO ELECTRICAL ENGINEERS.

J. B. Taylor Gives Illustrated Lecture Before Chicago Section, A. I. E. E., on Developments in This Line.

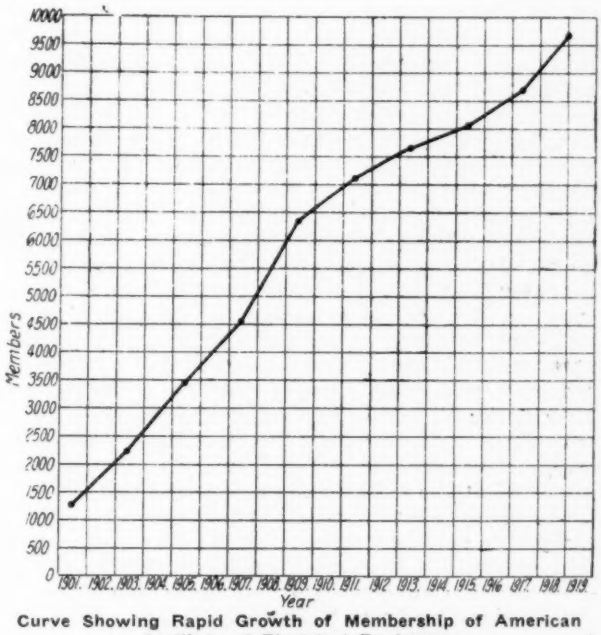
An interesting lecture and demonstration was given in Chicago on the evening of Feb. 24 before the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, by John B. Taylor, of Schenectady, N. Y. He presented a condensed review of the fundamentals of the laws of sound, and by means of illustrations showed how the shapes of sound waves resemble those of electric waves. Methods of recording sound waves were described and their applications to telephony and to acoustics explained.

Mr. Taylor showed how many of the principles of sound could be applied in an engineering way in a manner similar to the applications of the principles of light in illuminating engineering, and he therefore foresaw the development of a new branch of applied science that might be called acoustical engineering. He also explained and demonstrated the basic principles of many musical instruments, including the organ pipe, flute, oboe, clarionet, bassoon, etc. The characteristics of different types of phonograph records were also described and the wear of different kinds of needles shown.

MEMBERSHIP CAMPAIGN OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Active Campaign Undertaken to Increase the Membership —Booklet on Aims and Activities of Institute.

The war has given great prominence to engineers and has emphasized the importance of co-ordinated engineering effort, especially through well established engineering societies. In order to stimulate further interest in electrical engineering activities, the American Institute of Electrical Engineers has decided to carry on during the present year a very active membership campaign. Although the membership as of Jan. 1, 1919, was 9677, it is felt that there are perhaps



Curve Showing Rapid Growth of Membership of American Institute of Electrical Engineers.

thousands of electrical engineers who should not only be interested in but actively associated with this national body of electrical engineers. To carry on this campaign a special committee has been appointed, of which H. A. Pratt, 165 Broadway, New York City, is chairman.

A well illustrated and interesting booklet on the aims and activities of the A. I. E. E. has been published which gives pertinent facts not only regarding the Institute itself, such as its objects and general conduct of its business, but contains a number of brief statements by Past-Presidents C. F. Scott, J. W. Lieb, H. G. Stott, Gano Dunn and H. W. Buck, on the value of membership and the desirability of supporting this organization. Meetings and conventions, publications, local sections, student branches, committees, employment service, headquarters and library, and other facts of interest are described. Full lists are given of the sections, national and local officers and the Membership Committee. Copies of the booklet can be obtained from Secretary Hutchinson, 33 West 39th street, New York City, and from members of the Membership Committee.

Electric Welding and Many Technical Problems Discussed by A.I.E.E.

Midwinter Convention Exceptionally Well Attended—New Light Thrown on Welding, Standardization, Radiotelephony and High-tension Insulation

THE seventh midwinter convention of the American Institute of Electrical Engineers held in the Engineering Societies Building in New York City on February 19-21 was one of the most interesting and largely attended conventions that the Institute has held. The attendance was so large, in fact, that it was impossible to accommodate all of those who wished to attend the sessions and who wished to go on the inspection trips to manufacturing plants and laboratories in and about New York City. The number of printed copies of the papers delivered at the convention was only half large enough to supply the demand of those attending the sessions, although Secretary Hutchinson provided two or three times as many copies as the estimated attendance seemed to justify. The different committees having charge of the arrangements for the convention had made their arrangements in such detail, however, that, although the attendance was much larger than was anticipated, no changes of program or of plans were necessary.

Attendance was stimulated probably not only because of the general awakening of engineers to the fact that progress in electrical development during 1918 was as great as that which has occurred in any previous decade, but also because the papers which were delivered at the various sessions were selected with the idea of describing this development authentically. Moreover, the scope of subjects selected to be discussed at the different sessions was such as to attract the engineer interested in theoretical matters as well as the engineer interested in the practical application of such matter. The wide range of subjects discussed is indicated by reference to the paper by Dr. Steinmetz entitled "The General Equation of the Electric Circuit" and to the paper by S. V. Goodall entitled "Welding as a Process in Ship Construction."

Electric Welding.

The convention was opened by President Comfort A. Adams on Wednesday afternoon as a joint session with the American Institute of Mining Engineers which held its convention on February 17-19. The session, which was devoted to the art of welding was addressed by men from both groups of engineers. Papers read by G. F. Comstock, S. W. Miller, and H. M. Hobart, of the Institute of Mining Engineers, presented the subject as considered by the metallurgist, whereas papers by S. V. Goodall and by O. H. Eschholz, of the Institute of Electrical Engineers, presented the practical electrical phases of the subject as they are known at present.

After opening the session, President Adams described the work of the Electric Welding Committee and the things it had accomplished during its existence. The committee which consisted eventually of about 150 members and was recognized by the Shipping Board, accomplished as much in electrical welding in 1918 as was accomplished in the previous 10 years. Among the accomplishments of the committee was the development of the steel chain which is 40% stronger than the ordinary wrought-iron chain. On Jan. 1, the Emergency Fleet Corporation withdrew its support from the Electric Welding Committee, whereupon a joint welding bureau was organized. This bureau consists of representatives from all engineering societies and interested engineering organizations, including representatives from the bureaus of the different governmental departments. The scope of the work intended to be done by the present welding bureau will include the general development of electric and gas welding processes. The welding bureau will consist of a fusion of the previous committees on electric and gas welding into a general welding committee.

Papers by G. F. Comstock and by S. W. Miller described the metallographic structure of steel and iron at welds. The fact that the exigencies of the war made the development of gas and of electric welding necessary and that many defective welds have occurred that could not be explained readily has stimulated research work in welding. The demand for welding large and expensive parts is increasing since the comparatively cheap process of welding often can restore broken parts of machinery that are expensive or are difficult to reproduce. To determine the reason that many welds fail is a matter that is attracting considerable attention. Mr. Comstock and Mr. Miller presented a large amount of data that probably will lead to the explanation of many failures of welded parts.

Both speakers referred to the presence in the material near welds of a substance, probably an eutectoid, which is thought to be a nitride. The substance resembles pearlite in some instances but is known to be another substance. It occurs in two forms, namely, in small oblong spots and in needles. Since it is observed only in that portion of a specimen near the welded surface, it is thought to originate through the absorption of nitrogen from the air by the metal in the presence of temperatures extremely high.

Some of the statements made by Mr. Miller are that oxy-acetylene and electric welds are brittle; that rupture of welds always occurs at primary grain boundaries; that the carbon arc decarbonizes metal; that normalizing causes the formation of nitride needles; and the nitride and pearlite eutectics have a similar appearance. He concluded by saying that the largest amount of trouble on account of the failure of welds is caused by foreign material—possibly oxide—at the grain boundaries, and that welds must be made metallurgically sound.

H. M. Hobart and S. V. Goodall presented certain aspects of the serviceability of welded steel. The possibility of replacing riveted parts by welded parts was shown to be feasible in certain places; 40% of the cost of the structure of a steel ship is expended for riveting, whereas, 15-20% is expended for other labor and shop work. Any method of building, therefore, that will reduce the cost of riveting will reduce largely the cost of a steel ship. Since the British Admiralty and the American railroads have employed electric welding satisfactorily during the past 12 or 14 years, there is reason to believe that the process can be

applied to a plate welding in the construction of ships with a reduction of 20 to 40% in the weight of the plates. The principal difficulty in plate welding, as it is practiced at present, is that the welded parts lack uniformity. If the weld is satisfactory, it is usually stronger and is often tougher than the parent metal. A method of non-destructive testing of welded plates has been devised recently whereby the location of defective welds can be detected accurately. Two thirds of the specimens in a group which the non-destructive test indicated to be satisfactory broke outside of the weld when tested for tensile strength.

The fact was mentioned in the discussion following the papers not only that experiments are being made to determine the practicability of interlocking plates for hull construction, but also that a company has been formed to build hulls with interlocking plates.

In a paper entitled "Fusion in Arc Welding," O. H. Eschholz discussed some of the practical phases of arc welding. These phases consist of the length of arc and the characteristics of the finished weld. The short arc was shown to be more satisfactory than the long one because of the diminished amount of exposure of the deposited material to the surrounding air and of the diminished amount of oxidation of the material. Sections of welds show a definite relation between the integrity of the joint, the shape of the bead, and the overlap at the edge of the bead.

Discussion of the paper brought out the fact that welded steel pipe, 12 in. in diameter, is used in the explosives plant at Nitro, W. Va., that spot welding of plates less than 3 in. thick will produce joints as strong as the normal plate, and that the integrity of any welded joint depends largely on the carefulness of the workman who does the welding. Moreover, arc or gas welding is the only means available of repairing manganese-steel parts that have been broken. Joints which have been protected during the welding process by blue asbestos have been found to be more nearly uniform and satisfactory than joints protected by other material because the fused asbestos envelopes the fused metal globules with a particular kind of slag that excludes oxygen and nitrogen from the globules.

Standards and Electric Circuit.

The morning session of Feb. 20 was opened by President Adams who described the formation of the American Engineering Standards Committee. President Adams mentioned the fact that the War Department recognized the existence of 15 different standards of screw threads, whereas the Railroad Administration assumed control of 500 types of locomotives. After discussing the aims of the Standards Committee, he introduced C. P. Steinmetz who presented a third thesis entitled "The General Equations of the Electric Circuit," and H. S. Osborne who presented a review of the work of the Sub-committee on Wave-Shape Standard, of the Standards Committee.

Discussion of both papers was limited somewhat on account of a lack of time. The paper by Dr. Steinmetz was commented on as being another of his classic theses by Messrs. Scott, Underhill, and Kennelly. One of the practical features of his paper was the way in which he employed numerals in expressing frequencies. The method consists of expressing frequencies as logarithms of the base 10. Thus a frequency of 10 is of the order 1, a frequency of 100 is of the order 2, and so on. Dr. Steinmetz recommends the application of this idea to any discussion in which large quantities occur.

Mr. Osborne's paper promoted a considerable amount of discussion between telephone and central-station engineers. The discussion included such topics as telephone interference, a standard wave shape, and a standard noise. The opinion of the central-station men seemed to be to the effect that the telephone men should adopt a standard frequency and adhere to it. Such action by the telephone engineers would permit central-station engineers to design their apparatus so as not to interfere with the telephone equipment.

Dr. Steinmetz emphasized the fact that the sine wave is more nearly imaginary than real. His statement was that the sine wave is more a matter of sentiment than of experience, that the sine wave is merely a standard, but that it is possibly the best standardization that can be made. A standard noise as indicated by a telephone receiver was defined to be the amount of noise given by a certain frequency and wave shape passing through a telephone receiver. That the resonance of material in the receiver has an effect on the noise transmitted was mentioned.

Radio and Wire Telephony.

Friday's session opened with papers by E. B. Craft and E. H. Colpitts on "Radiotelephony" and by John R. Carson on "Theory of Transient Oscillations." The papers were unusual of their type. Mr. Carson's paper consisted of a mathematical treatment of his subject that was exhaustive, whereas, Messrs. Craft and Colpitt's paper consisted of a description of the development of the radiotelephone that was complete. The papers were discussed by Gen. G. O. Squier, Dr. Pupin of Columbia University, and by Alfred H. Coles.

General Squier reminded the audience of the fact that, whereas, all other forms of communication have been developed phenomenally during recent years, the ocean cables, as methods of communication, have been subject to scarcely any improvement since they were first installed. Because of inherent characteristics, the European cables are idle during six to nine hours per day. This loss of efficiency is particularly embarrassing at present when the cables are crowded with communications. Moreover, the absence of a universal cable language causes other delays and also many mistakes during decoding and translating operations. The United States Government is offering engineers the use of equipment and the Alaska cables for experimental purposes with the idea of improving the cable service.

The paper by W. W. Crawford, deceased, on "Telephone Circuits with Zero Mutual Induction," was read by title only.

Breakdown of High-Tension Insulation.

Lively discussions were inspired by the papers presented at the session on Friday afternoon. The paper by G. B. Shanklin and J. J. Matson, and that by F. Dubsky, being theoretical treatises of the causes of breakdown of the insulation on high-tension cables, were of special interest to engineers engaged in the manufacture and use of high-tension and power equipment. That the cause of such breakdowns in insulating material are not understood but are recognized as being important is shown by the diversity of opinions and views which were expressed during the discussion of these papers.

The general opinion, if such an opinion could be said to exist, was that entrapped air bubbles are the principal cause of breakdown. The opinion as to the specific condition or action of the air that causes the defects in insulating material was less harmonious

than the general opinion. Among the possible specific causes for breakdown which were mentioned are corona and its consequent perforation and destruction of the insulating material, ozone and nitric acid generated in the entrained air bubbles, general oxidation of insulating material, general heating of the material, and mechanical bombardment of the air particles against the walls of the air bubbles. Each cause had its advocate, although the last cause, that of mechanical bombardment, which was advocated by President Adams seemed most logical and was most substantially supported by experimental proof. This cause was further substantiated by experiments by Prof. E. E. F. Creighton on porcelain insulators. He found that the more porous porcelain insulators heated much more rapidly than the less porous insulators.

LECTURES, ENTERTAINMENTS AND INSPECTIONS.

Wednesday evening was devoted to a popular lecture by Dr. John A. Brashear on the subject, "An Evening with the New Astronomy." This was a very fascinating address and was followed by the display of moving pictures, whereas, Thursday evening was devoted to the dinner-dance at the Hotel Astor. Both lectures and dinner-dance were well attended. In fact the attendance on both evenings was about as large as could be accommodated.

The technical inspections also, on Thursday afternoon, attracted an unusual attendance. The party which visited the Brooklyn navy yard was restricted because of the large number of applications of members who wished to visit the yard. It was found necessary also to restrict the number of visitors to the Bell system laboratories. Other concerns which invited the attending members and guests to visit their works were the New York Edison Co., the United Electric Light & Power Co., the Interborough Rapid Transit Co., and the Electrical Testing Laboratories.

Abstracts of the technical papers presented at other than the welding session are given below:

Radio Telephony.

BY E. B. CRAFT AND E. H. COLPITTS.

This paper is divided into two parts. The first part describes the development of the art of radio telephony by the American Telephone and Telegraph Co. and the Western Electric Co. to the accomplishments of transatlantic telephony. This is followed by demonstrations of the use of radio telephony between ships and of methods of connecting radio and wire telephone systems. This first part covers work principally of an engineering research nature, the most important problems being the development of systems of generation, modulation, transmission and reception of radio telephone signals.

The second part is concerned almost entirely with the work of producing radio telephone and allied apparatus for the Army and Navy in the late war. The major problem of the second part was the design of light and compact sets which could be produced rapidly and in large numbers, for the main features of generating, modulating and receiving systems were already well understood.

Review of Work of Sub-Committee on Wave Shape Standard of the Standards Committee.

BY HAROLD S. OSBORNE.

The paper gives a review of the work done during the past three years by a sub-committee of the Standards Committee of the Institute appointed to make recommendations for changes in the Institute's rules regarding the wave shape of alternators. After a very careful consideration of the question and a large amount of experimental work the Sub-Committee last spring made recommendations that for the present the ten per cent deviation rule should be retained without change (except in wording), and that trial use should be made a supplementary wave shape factor. The new factor, based on the relation between voltage wave shape and interfering effect in telephone circuits, when power and telephone lines parallel each other, is called the "telephone interference factor." The committee invites the broadest discussion and trial use of the new factor. No attempt will be made to decide upon limiting values of the factor until after wide experience shall have been obtained in its use, and the committee will welcome assistance on the part of any interested in collecting information to this end.

Telephone Circuits with Zero Mutual Induction.

BY WILLIAM W. CRAWFORD.

The paper deals with the reduction of inductive interference in telephone circuits.

Various relative positions of two or more circuits, in which the mutual inductance is zero, and the mutual capacitance unbalance is approximately zero, are discussed. The most important case is that when the two wires of one circuit occupy opposite ends of one diagonal of a square, and the other circuit, the ends of the other diagonal. A phantom formed on circuits so related is nearly immune from external induction.

Several forms of construction embodying this arrangement, and built largely with standard parts, are illustrated. In these forms, about one third of the inductive relations of each physical circuit are with circuits in a position for approximately zero mutual inductance. The form of phantom transposition used automatically balances the circuits not so related.

Calculations and tentative designs are presented to show that the use of these forms of construction will give greatest refinement of balance against induction from power circuits, and possibly also against cross-talk, increased flexibility in co-ordinating with the variations in exposure to power circuits, a simplification of the transpositions system, fewer transposition poles and transpositions, and when desired, the realization of a part of these advantages with the lead compressed into less than the normal space. The improvement is greatest in the phantoms.

Adverse factors are the increased sensibility to cross-talk due to variations in sag, and the slightly increased capacitance of the phantoms.

The cost of original construction of the proposed forms should not be materially higher than for the present standard form. The cost of conversion of an existing lead to one of the proposed forms will be considerably greater than that of re-transposing the lead according to present practises.

Theory of the Transient Oscillations of Electrical Networks and Transmission Systems.

BY JOHN R. CARSON.

The purpose of this research was to make a broad theoretical study of transient phenomena with a view to developing methods of calculation directly applicable to engineering problems. The investigation starts with the problem of formulating the current in an electrical network or transmission system in response to a suddenly applied e.m.f. of arbitrary form. A simple formula is derived which expresses this current in terms of two independent functions: one, the applied e.m.f. expressed as a time function, and the other a character function of the constants and connections of the system, this latter being termed the "indicial admittance" of the system. A knowledge of the indicial admittance, therefore, completely determines the behavior of the system to all types of applied voltages including both transient and steady states. A systematic investigation of methods for solving and computing the indical admittance follows, in the course of which original solutions for transmission and artificial lines are derived and a new method involving integral equations is developed. This latter is particularly well adapted to handle the difficult problem of taking into account the effects of terminal impedance in transmission systems.

The Dielectric Strength of Air Films Entrapped in Solid Insulation and a Practical Application of the Problem for Alternator Coils and Cables.

BY F. DUBSKY.

It is of theoretical importance, as well as of practical importance in design, to be able to predetermine the dielectric strength of air films or bubbles entrapped in solid insulation.

If such films are over-stressed the solid insulation may be damaged by chemical action, local heating, mechanical action, etc., due to corona.

An experimental investigation was made of the strength

of air films of various thicknesses between glass plates. In the arrangement used, the breakdown of the air or the starting point of corona could be readily observed. Tests were also made of the dielectric strength of air films between other solid insulations.

It was found that the dielectric strength of air films between insulations was practically the same as the dielectric strength of air films between conductors.

The second part of the paper is devoted to the practical application of the data to the design of armature coils and cables, and several specific examples are given.

Abnormal Voltages Within Transformers.

By L. F. Blume and A. Boyajian.

Mathematical analysis is made of a rectangular wave impinging upon a transformer winding and quantitative values deduced of the resulting internal voltage stresses in terms of transformer constants. It is shown that the conclusions also apply in part to abrupt impulses and approximate idea is given of the reaction of transformer to high frequencies. The difference between operating transformer with isolated and grounded neutral is shown. Energy losses are not considered in the mathematics although the manner in which the results are affected is pointed out. Finally, theoretical results are compared with impulse and high-frequency tests made in the laboratory.

Ionization of Occluded Gases in High-Tension Insulation.

By G. B. Shanklin and J. J. Matson.

This paper deals with the ionization of occluded gases in solid insulation from the standpoint that these gas spaces are the weakest part of an insulation design and should receive first consideration. The stress at which ionization starts in different types of built-up insulation, such as used in cables and coils, is measured from these measurements and a safe working stress determined. The paper brings out, more than anything else, the importance of reducing the gas spaces to a minimum size, and using materials of the lowest possible permittivity, since the higher the permittivity the greater the stress on the gas spaces.

If an insulation design is worked at a stress so high that internal ionization occurs it should be considered as "over-stressed" and its life will certainly be shortened. Just how much it will be shortened depends upon such factors as; type of insulation used, degree of over-stressing, looseness and porosity, etc. Roughly, the life of an over-stressed design is anywhere from six months to six years, judging from numerous tests made. This shows that the damage is very gradual.

The General Equations of the Electric Circuit—III.

By Charles P. Steinmetz.

In the usual theory of transients the assumption is made that resistance, inductance, capacity and conductance are constant. This however, is not correct, and as the result thereof, it was not possible to theoretically investigate, and numerically calculate the dissipation of high-frequency disturbances, the flattening of the wave fronts of impulses, the rounding off of steep waves, etc., with the time and the distance of travel, and therefrom to determine the distance, to which the danger from such disturbances extends, and to investigate the conditions of line construction, which limit the danger zone of such phenomena to the smallest local extent.

In the following, two of the foremost causes of change of the line constants with the equivalent frequency are investigated, the unequal current distribution in the conductor, and the electric radiation from the conductor, and shown, that within the range of frequencies which may be met in industrial circuits, the effective resistance of the conductor, and its attenuation constant, may increase more than a million fold.

Equations of the line constants as function of the equivalent frequency are derived, and applications thereof made to a few problems:

(1) The laws of conduction of high-frequency currents, such as produced by lightning discharges and similar disturbances, and the conclusions resulting therefrom on the nature of the conductor.

(2) The decay of high-frequency sine waves in transmission lines.

(3) The attenuation of rectangular waves.

(4) The flattening of the wave front of steep impulses.

It is shown that in high-frequency conduction the section of the conductor is of little importance, but the circumference is the determining factor, except at very high frequencies, where size, shape, and material—within certain limits—becomes of secondary importance. The inductance and the capacity of the conductor remain constant up to very high frequencies, but the effective resistance may increase many thousand fold. At high frequencies, not all the energy consumed by the effective resistance of the conductor is converted into heat, but the major part may be radiated into space and thereby affect other circuits.

The conditions, which cause a flattening of steep wave fronts and impulses, and a rounding of irregular waves, are investigated, and it is shown, that within the range of distances in which danger may result from a steep wave front or high frequency, the steepness of the wave front decreases with the square root of the distance traveled by the wave; that size and material of the conductor have little influence, but the distance between conductor and return conductor is the main factor in flattening the wave front and thereby limiting the danger zone.

For convenience, the theoretical part has been separated and placed in an appendix, giving in the text the discussion, with numerous tables derived from the theoretical equations, and curves illustrating these tables.

The investigation is not general, but rather limited to special applications, as the field is too new to permit fargoing generalization.

NEW KANSAS CITY PLANT DESCRIBED FOR JOVIANS.

Electrical Men and City Officials Make Inspection of New Station Following Address.

The Jovian Electric League of Kansas City on Feb. 21 devoted the entire luncheon hour, and afternoon, to a discussion of the Kansas City Light & Power Co.'s new plant. F. S. Dewey, assistant general manager of the company, explained, with the help of slides, the construction work already done on the plant. Following the discussion, 50 of the men present at the luncheon visited the plant and inspected it thoroughly. The value of the event consisted in the fact that not only did Jovians see what Kansas City is going to get in the way of central-station facilities but that city officials and newspaper publishers, also had this opportunity. Among the visitors were the mayor, the superintendent of the water department, L. H. Chapman, water and light commissioner of Kansas City, Kan.; managers of industrial plants and newspaper men. C. C. Rosewater, publisher of the Kansas City *Journal*, remarked upon his new conception of the importance of electricity in the future industrial and business development of the community.

The Jovians and visitors were guests of the Kansas City Light & Power Co. at the luncheon.

NEW YORK JOVIAN LEAGUE DISSOLVED.

New Organization to Be Known as New York Electrical League.

Members of the New York Jovian League at a recent meeting in New York City unanimously voted to divorce themselves from the national order and hereafter will be known as the New York Electrical League. The new organization will have the same class of membership and will be devoted to the same purposes and principles as the old one; however, it will not be necessary for its members to be affiliated with the Jovian Order in the future. The officers, committees, etc., of the old organization will be retained in the same capacity in the new one.

Plans are being formulated for the organization of a permanent body to be known as the Electrical Board of Trade of the City of New York. The New York Electrical League membership will form the nucleus of this body.

Commercial Practice

Central-Station Sales Activities — Washington's Law on Street-Car Fares—Public Policy Ads of Dayton Company

SALES DEPARTMENT ACTIVITIES TO BE RENEWED.

Reports from Central Stations Show Effort to Put Business on Pre-War Basis.

A question that has been causing considerable concern lately has been, "what will be the policy of the central stations with regard to sales activities in view of the present conditions"? It is well known that during the period of the war, when utilities were hard pressed to take care of the abnormal demands for service from war industries, sales work was virtually discontinued. Government restrictions and high prices for material and labor also made it impossible to take on new business even in those localities where it would have been otherwise possible.

As a result of these conditions the sales or commercial departments of many central stations have been completely demoralized, men who entered the service have never been replaced and little if any interest has been taken in securing new customers. This situation, however, does not apply to the electric appliance business, which was given great impetus during the war, actual sales for 1918 being well over $10,000,000. In fact the new-business activities of a considerable number of companies were confined to increasing revenue from existing customers by the sales of appliance both for the home, factory and office.

In order to obtain first-hand information regarding the sales policies of the prominent utility companies, the ELECTRICAL REVIEW addressed an inquiry to a number of sales managers asking for an expression regarding immediate plans. The one outstanding feature of the replies can be summarized in the statement that practically without exception all expect to be back to a pre-war basis at the earliest possible moment.

Many of the replies record specific campaigns that are either now under way or else are in course of preparation, many others simply report that active solicitation is already started. Some sales managers have qualified their replies by stating that new business involving line extensions will only be taken under certain specified conditions but in general these conditions are only slightly less liberal than pre-war extension policies.

As a whole the results of the survey may well be considered as very encouraging and indicative of the optimism with which utilities view the future. Details regarding some of the sales plans will be given in a later issue.

ELECTRIC-VEHICLE CHARGING STATIONS MAKE TOURING POSSIBLE IN EAST.

A chain of charging stations, extending in all directions from New York City, now make it possible for electric-vehicle owners to reach points a hundred or more miles away without fear of becoming stranded. A battery boost at Lakewood makes Atlantic City a fine one-day run; boosting stations in eastern Connecticut and central Massachusetts bring Boston within reach of the electric car; stations at New Brunswick and Trenton make the Philadelphia run easy, and south of Philadelphia there are charging stations all the way to Washington.

Electric vehicle routes from New York to Philadelphia, to Atlantic City, to Easton, Pa., to Ellenville in the foothills of the Catskill Mountains, to Pittsfield, Mass., and to New Haven, Conn., are described in the 1919 automobile handbook just issued by the New York Electric Vehicle Association. Included is a complete list of charging stations in and near New York, with particulars as to capacity and rates.

The booklet is designed to aid not only the electric-vehicle tourist but the operator of electric commercial vehicles whose deliveries are in the suburbs. The book will be sent free upon request to the Association, Irving place and Fifteenth street, New York.

WASHINGTON'S LAW GOVERNING STREET-CAR FARES.

Municipal Lines to Be Regulated by City Council, Company Lines by State Public Service Commission.

The Legislature of the State of Washington has passed a measure providing that passenger fares on municipally owned street-car lines be placed under control of the municipality, and that fares on cars of privately owned lines be under control of the Public Service Commission. This serves to clear the atmosphere both for public utility companies and those municipalities which have taken over the operation of street-car systems. It is understood to supersede the law which restricted street-car fares to five cents in any municipality in Washington. It offers relief in such cases as those at Spokane and Tacoma in which utility companies needed greater revenues but were restrained from raising passenger rates. This also gives Seattle's city council authority to resort to higher fares in order to meet any possible revenue shortage in the operation of the traction lines which the city recently purchased.

Under the former law the Public Service Commission was powerless to adjust street-car rates to fit times and conditions. It can now act upon applications made asking for readjustments. The act has an emergency clause whereby it became effective after having received the governor's signature on Feb. 15. The new law abrogates any rate provision contained in any street-railway franchise in conflict therewith.

Since the Washington Legislature repealed the law limiting street-car fares to five cents, and placing the matter respecting company lines in the hands of the Public Service Commission, the Washington Water Power Co. and the Spokane & Inland Empire Railway Co., both operating street-car lines in Spokane, have petitioned the Commission to allow an advance in fares.

Notable Series of Public Policy Ads

First 9 of a Series of 12 Effective Advertisements Just Completed by Dayton Power & Light Co., in Wilmington District

ELECTRIC TALKS
NO 1

INTRODUCTION.

We have decided to run a short series of advertisements in this paper in newspapers in the hope that our customers and all the citizens of Wilmington may have a better understanding regarding the various phases relating into the supply of ELECTRIC SERVICE.

This series of advertisements will not refer to one make supply service, that particular branch of our business will be handled by a separate series of statements later.

The interests of the citizens of Wilmington and this Company are identical and we hope you will read these statements regarding ELECTRIC SERVICE conditions in Wilmington and bring them to the attention of your neighbors and friends.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electric talk No. 2 will appear Thursday, January 9, 1919.

ELECTRIC TALKS
NO 2

Use Electric Service.

There are still many homes and places of business in Wilmington that are not using our service and we believe it is only proper to bring to their attention our desire to serve them with good ELECTRIC SERVICE at rates that are very reasonable.

Wilmington is fortunate in having good electrical contractors and dealers who are well established and who are ready to take care of the wiring of your property and equipping it for the many conveniences that go to make ELECTRIC SERVICE—now a necessity.

ELECTRIC SERVICE is the home maiden you to use many LABOR SAVING devices such as electric irons, washing machines, vacuum cleaners, sewing machine motors, fans and other electrical appliances such as toasters, heating pads and the many electrical utensils that are now on the market for COOKING purposes.

There is no time like the present to avail yourself of this service—let us take this matter up with you in detail.

We know you will be well satisfied with our service and the rates charged are based on cost.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO
HOWARD I. FOX, Superintendent.

Electric talk No. 3 will appear Tuesday, January 14, 1919.

ELECTRIC TALKS
NO 3

EXPERT SERVICE.

We want our present and prospective customers to avail themselves of our services at all times—remember the supply of ELECTRIC SERVICE is our business and we are always studying the electrical requirements of the community and our customers.

We are most anxious to give information to the end that the most satisfactory results may be obtained for electric light power and heating.

Lighting and power experts are at your disposal for the asking—no charge whatsoever is made for their services.

We want you to use ELECTRIC SERVICE in the most economical way—let us know when we can be of help to you.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electrical talk No. 4 will appear January 16, 1919.

ELECTRIC TALKS
NO 4

Becoming A Customer.

When you have made up your mind to use our service, let us know at once. We will be glad to have our representatives call and secure your application for service—this will save a visit to our office.

We will then commence to make arrangements to see that the service is supplied as soon after your electrical equipment is all installed, as possible.

Quite often extensions and changes are necessary to our distribution system to supply ELECTRIC SERVICE to new customers, therefore, it is always best to notify us as soon as you decide to use the service.

Delays sometimes occur but it is our desire to supply the service as promptly as possible.

REMEMBER—We are here to serve you.

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electrical talk No. 5 will appear January 21, 1919.

ELECTRIC TALKS
NO 5

Interruptions to Service.

While we desire to make our service as nearly perfect as is possible, we must admit that occasionally interruptions in our service occur through no fault of our own.

We have expert repair and linemen available at all times of the day or night ready to respond upon learning of a service interruption at our power station, with the transmission or distribution system of the Company or on the premises of a customer.

These men will make ordinary repairs upon customers premises without charge or will notify the customer what should be done when the matter is one that can not be properly repaired at the time.

We probably suffer most when service interruptions occur.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO
HOWARD I. FOX, Superintendent.

Electric Talk No. 6 will appear January 28, 1919.

ELECTRIC TALKS
NO 6

Complaints.

We do not like to think of there being any reason for complaints regarding our service or of the size of the monthly bills of any of our customers and yet in handling the number of bills we do each month we appreciate that mistakes occasionally will occur that will call for investigation.

We hope our customers will advise us in the event of a mistake occurring or of any complaint regarding the service. That is the way to have a mistake rectified—do not discuss it with your neighbor or friends that will not be able to help you—COME TO US AT ONCE.

We promise prompt attention to all complaints.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electric Talk No. 7 will appear January 28, 1919.

ELECTRIC TALKS
NO 7

The Public Be Pleased.

We appreciate the importance of supplying good ELECTRIC SERVICE at reasonable rates and of having employes who are COURTEOUS at all times. This assures us of having satisfied customers and of supplying a service beyond criticism from the citizens of the community in which we operate.

It has been and will continue to be our policy to endeavor to satisfy our customers at all times. The Company requires its employes to give every courtesy to our customers and the citizens of Wilmington.

As Superintendent of this District, I will receive personally all who wish to see me and will be glad to see that personal attention as far as possible, is given to the matters brought to my attention.

We would appreciate any acts of discourtesy or any evidence on the part of our employes of a [illegible] not given entire satisfaction being brought to our attention.

We want to please our customers and the citizens of Wilmington.

REMEMBER—We are here to serve you.

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electric Talk No. 8 will appear January 30, 1919.

ELECTRIC TALKS
NO. 8

Growth and Prosperity

The growth and prosperity of our property depends upon the growth and prosperity of Wilmington. Therefore you can count on the Company playing its proper part in every activity for the good of Wilmington.

We believe in the future of Wilmington and with the completion of our transmission line to Xenia—Wilmington will soon have unlimited electric power resources at her command.

Wilmington's commercial prestige can be greatly advanced by the use of a larger quantity of electric light in the business districts. Attractive electric signs, good window and show lighting—a general air—where of brightness, hospitality and cheer will contribute much to the city's prosperity as a trade center.

We want to grow with Wilmington.

REMEMBER—We are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electrical Talk No. 9 will appear February 4, 1919.

ELECTRIC TALKS
NO. 9.

Rates.

We want to remind our customers in Wilmington that during the terrible war, that we hope will soon be brought to a close in Europe by a lasting peace, that our rates for ELECTRIC SERVICE were not raised.

We believe that Wilmington is one of a very few communities whose electric rates were not raised to meet the greatly increased costs that had to be borne by the Electric Company supplying the service.

We think it is only fair to say at this time that the schedule of electric rates in Wilmington is not entirely satisfactory in that sufficient revenue is not derived to assure adequate and satisfactory service and we hope in the future to secure from the City Council a new schedule that will be more equitable to all, especially when viewed from the standpoint of a higher level of costs which has been established since the time that the present schedule became effective.

Good ELECTRIC SERVICE at reasonable rates is most desirable for the good of the community and the Electric Company.

REMEMBER—we are here to serve you

The Wilmington District
—of—
THE DAYTON POWER & LIGHT CO.
HOWARD I. FOX, Superintendent.

Electric Talk No. 10 will appear February 6, 1919.

The accompanying illustrations show the first 9 of a series of 12 public policy advertisements which have just been completed by the Dayton (Ohio) Power & Light Co., in the Wilmington district. The series is one of the most commendable, simple and yet complete of its kind and already has resulted in improved relations with the public. Each advertisement discusses some phase of utility operation in a frank and understandable manner, the keynote of each message being, "Remember, We Are Here to Serve You." The three remaining advertisements, which will be reproduced in a later issue, discuss customer ownership of utility stock, electrical resources of Wilmington and co-operation.

Operating Practice

Safety Device—Regulator Trouble—Structural Considerations for Portable Substations—Transformer Voltages

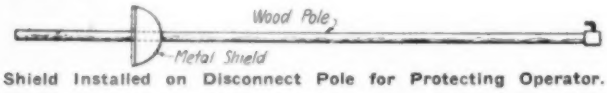
CONVENIENT SAFETY SHIELD FOR CLIP PULLERS.

Addition of Safety Shield Gives Extra Protection to Operators.

By W. M. Norris.

The clip puller and disconnect pole are necessities of almost every substation, and certainly are needed by the majority of high-voltage outdoor substations, for manipulating main-line disconnect switches, removing fuses, lightning arrester jumpers and for similar purposes.

Usually the clip puller consists of a length of dry wood that has been specially treated and varnished so as to possess high insulating properties. At its end a device for operating the disconnect switch, etc., is fastened. The accompanying illustration shows a form of disconnect puller that has much to recommend it. It will be noticed that this rod has a shield installed upon it at a position where it will come immediately above the operator's hand nearest the high-voltage conductor.



Shield Installed on Disconnect Pole for Protecting Operator.

This shield answers several purposes. It tends to prevent the operator unconsciously placing his hands too far up the pole—that is, too close to the hook that comes into contact with the high-potential. It tends to prevent rain trickling down the rod and into contact with the operator—a condition that may occur in outdoor substations where there is much switching to be done in wet weather. Thirdly, the shield would tend to divert or throw off a falling wire from the hand of the operator. The first two reasons—the chief ones—suffice to make the use of a shield, as shown, a wise safety measure for high-voltage outdoor installations especially.

PECULIAR TROUBLE WITH AUTOMATIC VOLTAGE REGULATOR.

Vibrations Superimposed Caused Defective Voltage Regulation.

By L. A. Martin.

In a substation containing a number of induction feeder regulators trouble was chronic. These regulators were of 150 amperes capacity and had their secondary or reversing relays installed on top of them, as had all the other regulators in the substation. However, out of the thirty odd regulators in the station, three gave trouble.

The trouble consisted of erratic operation. On inspection these regulators, automatically operated by contact-making voltmeters of the compensated type, would appear to operate satisfactorily. They would then for no apparent reason refuse to operate, allowing the voltage to remain low or high, as the case might be, until operated by hand. Inspection at such times would show that the contacts of the contact-makers were within their specified range, the contact surfaces were good, mechanically and electrically. With the contact-makers contacts closed, the reversing switch would also operate, but the regulator rotor would not rotate. Cleaning and adjusting the contacts of the reversing switches (of the G. E. pendulum type) had no effect. Although all the contacts of both relays were closed and the supply circuit to the regulator motor apparently closed, the motor did not show any indication of wanting to work.

One possible explanation was that the contact-maker contacts, of tungsten, had oxidized, hence offered such a high resistance to current flow that the pendulum relays were not functioning properly. This was not, however, the case. Excessive brake or bearing friction in the regulator was not the cause either, as the motor driving the regulator was not exerting torque.

Close investigations brought to light several interesting facts. The regulators that habitually gave trouble were installed on a concrete floor supported by girders in such a way that there was considerable vibration under the influence of the regulator exciting current. There was also, as is always the case, vibration in the pendulum reversing switch. The vibration of the troublesome regulators was increased due to their resting on the girder beneath the floor. The vibration of the relay was increased due the vibration of the regulator, and the sum total was that although the relay contacts appeared to the eye to be closed, there was such rapid make and break that current was not supplied to the motor.

Rubber Installed Underneath Relays.

It should be pointed out that the relays were mounted on top of their respective regulators, being bolted through one of the bolts that bolt the cover to the case, with additional bolts tapped into the regulator cover. The relay and regulator were rigidly connected together therefore. As a remedy, thick pieces of fiber were inserted between relays and regulator, and the clamping bolts screwed down. This, however, solved the problem only for a few weeks, until the fiber had lost its resiliency, when the old trouble occurred again. The final solution consisted of installing thick pieces of sponge rubber, each about ½ in. in thickness underneath the relay, and leaving the relay bolts such that there was ample play for the relay. This overcame the trouble. It should be stated that the practice of the General Electric Co. is to mount their reversing relays upon slabs, which in turn are installed against the side of the regulator case. Had this practice been followed by the operating company the above trouble would undoubtedly not have occurred.

STRUCTURAL CONSIDERATIONS INVOLVED IN CONSTRUCTION OF PORTABLE RAILWAY SUBSTATIONS.

By C. F. Lloyd.

Portable substations have certain merits and can be used to advantage in many cases, the most common being as follows:

1. It is the cheapest substation that can be installed.
2. It can serve as a spare unit for several substations, thus decreasing the initial cost of substation apparatus.
3. It can be used to increase the capacity of a permanent substation, when the load becomes unusually heavy at certain periods, due to fairs, holidays, etc.
4. Its flexibility of operation is perfect. Power can be supplied where and when needed. Points of greatest power demand, vary with the seasons and the portable can be moved with the demand.
5. It is invaluable for carrying the load when overhauling or rebuilding a permanent substation.
6. It is invaluable when building an extension.
7. It is invaluable when locating a permanent substation on a new extension.

The important factors to be borne in mind in the design of a portable substation, are as follows:

1. It should be mounted in an all steel car, fireproof throughout.
2. Its weight and length must be a minimum, which is obtained only after careful choice and arrangement of apparatus.
3. The design must be satisfactory from a "safety-first" standpoint. The semi-outdoor construction where the high-tension wiring and switching is out of reach of the operator and does not enter the cab, is recommended.
4. To make the portable an ideal emergency unit that can be operated without hazard to the apparatus or the operator, whether he is familiar with the substation or not, a minimum amount of apparatus with simple arrangement, must be used.
5. All apparatus must be securely anchored to the car floor and framing, and the rotating apparatus must be arranged for leveling the shaft, regardless of the location of the substation.
6. Good ventilation is essential for both the apparatus and the operator.
7. All doors, windows, etc., must be made very tight against all kinds of weather conditions.

ABNORMAL VOLTAGES WITHIN TRANSFORMERS.

Facts Concerning Protecting Transformers from Internal Dielectric Failures.

To avoid breakdown of transformers resulting from abnormal potentials, the present practice is to either safeguard the transformer winding by external protective apparatus or to insulate the windings by sufficient insulation. A third method is to design the transformer so that voltage disturbances entering the winding will not result in the piling up of potential.

In a paper read before the A. I. E. E. in New York, February 21, on the above subject, by L. F. Blume and A. Boyajian it is brought out, both theoretically and experimentally that transformers differ from transmission lines on account of the presence of coil-to-coil capacitance and mutual inductance. In attempting to prevent transformer breakdowns, three types of disturbances must be recognized, namely, the abrupt impulse, the rectangular wave with long tail and high-frequency voltage sustained and damped.

The presence of coil capacitance causes transformers to respond as a capacitance and not as an inductance to abrupt impulses and towards all frequencies above its lower natural frequencies of oscillation. The more abrupt the impressed impulses upon a transformer, the greater the concentration of voltage at the ends of the coils. The voltage concentration in the end coils depends upon the value of series and ground capacitance and is independent of the number of turns. Hence the volts per turn on the end turns is inversely as the number of turns per coil. Obviously, therefore, extra turn insulation will be effective only when designed that the increase in dielectric strength is greater than the increase in voltage concentration. It is immaterial with high-frequency oscillations and abrupt impulses whether or not the neutral is grounded.

For rectangular waves and long tails the amplitude of the impressed oscillations depend not only upon the impressed oscillations but also on the ratio of total capacitance of winding to ground to total coil capacitance from one end of the stack to the other, and whether the neutral is earthed or not. As there is not simple relation between wave length and frequency, waves cannot penetrate into a transformer winding without distortion.

When high-frequency waves enter a transformer, and the applied high-frequency of the transformer is greater than the natural frequency of the transformer, the reaction of the transformer is similar to that occurring when the incoming wave consists of abrupt impulses. Although, theoretically, an impressed sustained wave of high frequency will cause a transformer to resonate and indefinite potentials to pile up till only limited by internal losses, in practice, the potential built up by resonance is limited by the relative values of surge impedance of both the transformer itself and the line. Actually, the extremely high potentials theoretically indicated may not occur, however, because the internal capacitance of the transformer shunts the windings and thus decreases the rapidity with which the voltage accumulates; and because of internal transformer losses.

OBTAINING CALORIFIC VALUES OF COAL.

The purchase of coal upon specification is a profitable proposition provided coal deliveries are analyzed and adherence to the specifications is enforced. To this end every power plant should possess a calorimeter and necessary equipment for obtaining the approximate analysis of coal or at least establish a thermal record of coal used by sending samples to a reliable laboratory. If these are not feasible the approximate or "litharge" method may be utilized to advantage. This method is as follows:

Weigh out one gram of finely powdered dry coal, thoroughly mix with 60 grams of pure litharge and about 10 grams of ground glass. Place in a clay crucible, and cover with a layer of common salt. Fire to a bright red heat in a boiler furnace, or similar source of heat, for 15 to 20 minutes. After the crucible is cold, break and extract the lead button that remains. The weight in grams of the lead button, when all slag has been removed, multiplied by 483 gives the calorific value of the coal in B.t.u.'s per lb. The constant 483 is obtained from the equation $C+2H+3Pbo=CO_2+H_2O+3Pbo$ whence it is seen that one part of C and H reduces 44.3 parts of Pb. The calorific value of H is about 62,000 B.t.u. per lb., and carbon is about 14,560 B.t.u. per lb.

The calorific value of a mixture of C and H in the proportions given by the equation is 21,350 B.t.u. per lb., that is—

44.3 grams of lead represent 21,350 B.t.u. per lb.—that is, one gram of lead gives 483 B.t.u. per lb.

The various assumptions made and calculated are not strictly true but the errors cancel out to a great extent.

Contractor-Dealer

Use of Appliances Increased by War—Creating Market—Appliance Sales Schedule—Lighting Units in Logging Camps

HOW THE WAR INCREASED USE OF HOUSEHOLD APPLIANCES.

Scarcity of Labor, Principal Cause of Increased Demand Is Likely to Continue.

At the annual state conference of Home Demonstration and Home Economic Agents held at the Mississippi Agricultural College recently, Raymond Marsh, secretary of the American Washing Machine Manufacturers' Association, of Chicago, delivered an address entitled "How the War Developed an Increased Use of Household Labor-Saving Devices." In this address Mr. Marsh explained very clearly how the conditions brought about by the war, especially the scarcity of domestic servants had increased the demand for the various types of modern household appliances and also why this demand was likely to continue. This speech was substantially as follows.

Everyone knows how and why the war developed a shortage of labor in this country. The records of the United States Employment Service show that during 1918, 4,211,942 applicants applied to the service for employment and that during that period there were 8,799,798 calls on the employment offices for help—or more than two calls for every applicant seeking work. The shortage of labor applied to skilled and unskilled, male and female, for the women of the country responded to the call nobly. The shifting of women labor from the home to the factory, to the railroad and to the business office was enormous.

According to the reports of the United States Department of Labor, about 2,000,000 women were employed in this country in factories and plants operating to full capacity on direct war work. This figure does not include women employed in factories and plants producing those commodities which, during the period of the war, were classed and called less-essentials. A wonderful story could be told about how women went into factories and recovered, entirely, from their awe and fear of machinery. Experience has shown that women are and can be efficient at running machinery. This changed attitude of women toward machinery is illustrated very forcefully by the fact that during the recent automobile show held in Chicago it was noticed how women invariably made inquiries about the engine and other technicalities of the mechanism. During the war, women rendered efficient service working hydraulic presses, heating and charging furnaces, welding brass, forging chains, molding bricks, constructing compasses, turning out electric lamps, producing munitions, operating tractors and a thousand and one other important and necessary tasks.

The shifting of women labor from the home to the industrial tasks enumerated was not so great in this country as it was in England or France but it was great enough to create an acute shortage of "domestics" or household servants. It is estimated by competent authorities that over 50% of the woman labor which shifted from home to industry, before the war, were engaged as domestics or household servants.

Contrary to expectation, the signing of the armistice has not relieved the shortage of domestics. In a comparative report issued by the United States Employment Service, it is shown that following the armistice and up to Dec. 21, the demand for female labor suffered a marked decrease. Beginning with the week following the later date, however, both demand and supply showed an upward trend throughout the country. At the close of the week ending Dec. 21 the demand for this class of labor had fallen, approximately, to 33,000 and the supply to 16,000. The tide turned, the figures show, with the beginning of the next week, at the close of which, Dec. 28, the demand was approximately, 43,000; supply 22,000. The heaviest demand for female labor in any given week is placed at 58,000 for the week ending Nov. 2, at which time the supply stood at 23,000 and from about that date up to Dec. 28, the demand exceeded the supply by an average of about 19,000.

A short supply of any kind of labor always brings an increase in the wage demanded by that kind of labor. As a consequence, the sky is the only limit on wages now being demanded by household servants. Many housewives cannot afford to pay the wages demanded; and they are thus forced to purchase household labor-saving devices which, paid for on long time terms, soon earn their original cost. Almost from time immemorial every important general advance in wage rates has been followed by a new movement in the direction of installing labor saving devices and machinery. The greatest wage advance in all time has occurred in the past three years and it would be strange, indeed, if the usual results did not follow.

As the soldiers of the American Expeditionary Forces return to this country, it is safe to assume that many of them will take over the work performed by women during the war. The fact must be kept in mind, however, that women who entered business during the war and who now may be forced to return to the home and to the household duties have learned, to the full, the value of labor saving devices. They have learned that the office, factory and railroad in this country is equipped with the latest, modern, labor-saving devices. They have learned the value and utility of such devices; and they have learned how to use them. This knowledge, gained from actual, practical experience will be taken into every home into which these women, who did so much for their country during the war, enter either as a housewife or as a household servant. No one can forcast the enormous demand for household labor saving devices which will exist in this country for the next five or ten years as a direct result and heritage of the war.

The eight hour day and less in the factory and in the office has been made possible only by the intelligent use of tools and machinery. By the use of tools and machinery, production in factory and office has been increased so much that the American business man has

been able to reduce the number of daily working hours. This is an age of labor-saving devices and economy of time, labor, money and health. Women have learned these things from actual experience. They will now demand that the same labor conditions prevail in the home.

With things as they are, the comparatively new United States Employment Service must be accepted as the barometer of the servant supply. The insistent demand for women munitions factory operatives is said to be gone but the nation-wide shortage of domestics, laundry workers, cooks, kitchen, pantry and nursery maids and waitresses remains. The New England States and New York, Pennsylvania and New Jersey had no extra houseworkers on the latest reports and had registered needs for more than 1000 and, even in the South and Far West, where there is a little factory work, by comparison, the homes were calling for help.

It seems evident therefore that families must arrange their scheme of living so they will want still less of anything that necessitates outside help. From a situation where families do with indifferent servants they may pass to one where they must do without, and that points to the necessity of utilizing all labor-saving devices that have been demonstrated as efficient, electric laundering and cleaning appliances especially. Instead of architects designing houses that can be managed with the minimum of salaried labor they will have to put their wits to work on the kind that can be operated without any. The mistress will not wish to take on the so-called drudgery that the old professional servant is quitting but will look about to arrange her household so that it will be as nearly workless as ingenuity and modern science can make it."

And the farmer's wife needs household labor-saving devices even more than the city housewife. In the first place, the farmer's wife has had even greater difficulties with the servant problem. The farmer cannot secure the utmost of production, however, unless he uses machinery—labor-saving devices—wherever and whenever possible. He will need additional labor to harvest the enormous crops expected. Additional labor on the farm, means extra work for the farmer's wife. Will she, alone, be expected to carry the increased burden of the kitchen and home or will she persuade her husband to install for her labor-saving household devices? Will the farmer's wife spend her days over the old-fashioned, obsolete wash tub and her nights over the old fashioned ironing board, or will she purchase a washing and ironing machine? Will she break her back and ruin not only her health, but endanger that of the next generation by working over a wash board, or will she have her time, her money, and her health by using a washing machine?

In the rural home, the washing has to be done at home, where, for sanitary reasons, the family washing ought to be done. If the intelligent farmer who has purchased up-to-date labor-saving implements for use in his work will but think about it, he will not permit his wife to kill herself and endanger the life of the coming generation doing her housework by ancient methods.

Farming in this country is daily becoming more and more of a science. Successful farming demands the latest labor-saving devices and machinery. The latest discoveries and methods concerning farming and dairying such as the "Babcock test," etc., have made farmers become efficient in order to attain success. The same thought and attention which has been applied to farming and farm methods if applied to the daily household tasks would revolutionize the work of the farmer's wife.

Furthermore studies made by the United States Census Bureau have shown that the infant mortality among workers in textile mills is not so great as among women who live at home, and do their own work, which includes carrying water from the well to the house, doing washing by ancient methods, and emptying heavy tubs of water. If the one weekly burden of the family washing could be relieved the records would not show that a larger percentage of babies die in the first month of life in the country than in the city.

There is but one way to relieve this weekly burden, and that is by purchasing and using a washing machine.

The electric washing machine for domestic use is not an experiment. It does its work rapidly and successfully. The theory of the machine is the agitation of clothes and water and the forcing of a soapy solution through the clothes. Millions of washing machines are sold every year; and more and more of them will be sold as housewives learn why the family washing should be done in the home and how quickly it can be done there by the use of a machine.

CREATING A NEW MARKET BEYOND THE DISTRIBUTING LINES.

Increasingly Large Field for Contractor-Dealers for Sale of Farm Lighting Plants.

The average electrical dealer feels that his market ends at the last pole on his local central distributing line. So it does for the average man; it is the man with the imagination and push who can see something beyond, and go after it. All he needs is a tip, that there is a market for a little generating plant on every prosperous farm, and he's off to sell one.

In this line he finds the ground has been broken for him by the automobile, the tractor and the portable gasoline engine. Most farmers are quite familiar with the operation and care of a gasoline engine: they understand its little peculiarities and how to make it go. "Yes," you'll say, "and they know all its cussedness, too." Stop a moment; isn't that due to the way most engines are knocked around? If you set up an engine on a permanent foundation where it will keep warm in winter, and especially if it has an electric starter, it doesn't take much attention to get absolutely reliable service.

The big talking point in selling one of these plants is that the farmer will have the same conveniences—electric light, running water, motor drive for washing machine, and a vacuum cleaner, electric fan, and electric iron, as his brother in town, and his friend Jones who has a farm no better than his own on a power line. Not only his pride, but his consideration for his wife can be appealed to, for electricity in the home means, relatively, the same increase in efficiency as farm machinery means to himself, and for the housewife, direct drive by an engine is no substitute, since as a rule a woman cannot start it, and does not like to work near it, nor have the kiddies in the same room. Since the electric plant is started by pressing one button, and stopped by pressing another one, anyone can "manage" it without trouble.

The possibility of the electrified farm as a permanent market is not to be overlooked. Lamp renew-

als, new appliances (of which there are many), occasional battery service, mean a steady revenue, and eventually a new battery will be required when too frequent charging becomes necessary. One plant leads to another on the next farm, and when enough farmers have gotten a taste of electrical convenience, it is often possible to get them to combine in building a power line to the nearest central-station circuit, which opens the possibility of selling them power motors.

Don't think that a gasoline plant is going to keep out central-station service: the invariable experience is that a farmer is going to want a motor for feed-grinding, or churning, or separating his milk, and the little plant isn't strong enough to do that. So when his battery wears out, it's a good time to get him over to "the big stuff."

Of course, there's no way like seeing a plant in action, and if the dealer can put one of the sets in the back of his delivery truck and take it out where all the family can see it run and what it will do for them, the sale is practically made. Any direct-connected plant can be handled this way using the smallest storage battery: and a belted plant assembled on a skid can also be carried around without much trouble. Remember that this plant means city comforts for the women-folks, and play up to them; it's the wife who is your best ally.

Remember, too, that you're selling electrical service—that means the job complete, from the generator to the last appliance, with a profit on every item.

YEARLY SALES SCHEDULE FOR SEASONAL APPLIANCE SALES.

Much has been said about seasonal sales of current-consuming appliances. The Society for Electrical development and similar bodies have co-operated with central stations and contractors and dealers on many occasions for special campaigns for the sale of devices. The accompanying schedule, which was prepared by the Westinghouse Electric and Manufacturing Co. was compiled to assist retailers in planning their yearly campaigns well ahead of time. Special attention has been paid to two general principles, (1) that there is one or more seasons in the year in which each individual item is more salable than at any other time, and, (2) that every item of merchandise should receive its just share of sales effort.

Past experience has proved the benefit of seasonal appliance campaigns, and the wisdom of featuring certain appliances at one time instead of making no special feature display. At the present time when so much is being said about helping the electrical dealer prevent the sale of appliances going to department stores, druggists and hardware stores, it would seem that co-operation between dealers and the local utility, both working together on a common schedule, would be of benefit to both. In any case adherence to a definite schedule enables a dealer to plan ahead, a condition favorable to low cost of doing business, efficiency and success.

DELCO LIGHTING UNITS ARE UTILIZED IN LOGGING CAMPS.

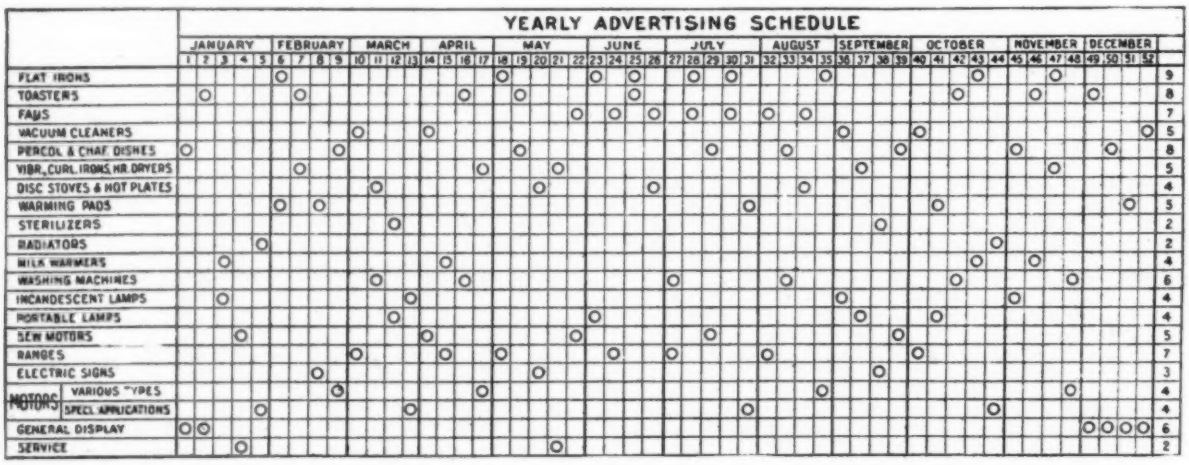
Fire Hazard Reduced and Workmen Pleased Through Improved Lighting from Self-Contained Lighting Plants.

Delco lighting plants have been installed in about 25 of the logging camps in Oregon and Washington within the last two years, in units ranging from ¾-kw. to 3-kw. The installations serve for lighting at yarding camps, cook houses and bunk rooms in localities not within range of electric light and power lines from central generating stations. The Delco plant, comprising an air-cooled engine, generator and switchboard, all in one unit, is readily moved to new places in the woods as the progress of work requires. In some cases kerosene oil is used as fuel, rather than gasoline, and this contributes to economy of lighting. As is generally known, the Delco lead batteries are used in connection with these sets.

This system, in isolated logging camps, creates better living conditions, making better satisfied employes, and tends greatly to reduce the fire hazard by eliminating oil lamps.

COST ACCOUNTING EXPLAINED TO ELECTRICAL CONTRACTORS.

A very enthusiastic and instructive meeting was held by the Massachusetts State Association of Electrical Contractors and Dealers at the American House, Boston, on Feb. 25. A special feature of this gathering was the display of different forms by George Murphy, who also explained the system of cost accounting for electrical contractors. This system has been officially accepted by the National Electrical Credit Men's Association, the Manufacturers' Association, the National Electric Light Association and the National Association of Electrical Contractors and Dealers.



Yearly Sales Schedule for the Retailer or Central Station That Plans His Sales Campaigns Well Ahead.

New Appliances

Combined Bell-Ringing Transformer and Socket Plug—Handy Electrically Driven Bench Saw for Woodworking

Socket Type Bell-Ringing Transformer.

The annoyance of having all the bells in the house out of commission is not only irritating, but it is a confession of unprogressiveness and outright neglect. The sign not uncommonly seen at the push button, "Bell out of order," is also most times an untruth, since over nine times out of ten it is not the bell but the battery. Obviously, the remedy is to put in a bell-ringing transformer in place of the battery. Such transformers have steadily increased in popularity and use because of their many advantages that should be well known to all electrical men.

To further increase the use of such bell ringers, the Betts & Betts Corporation, 511 West 42nd street, New York City, has added to its bell transformers the new type illustrated herewith. It is a combination of a plug and socket with a compact and light-weight low-voltage transformer, the whole serving much

The B & B Bell Ringer and Plug-Socket Combined.

like a current tap except that the branch circuit is of low voltage especially suitable for operating bells, buzzers, annunciators and the like. This particular device is a modification of the socket type Liberty bell ringers known as types L-1 and L-2, which can be plugged into any screw socket or receptacle. The new model has the binding posts for the bell circuit at the side instead of at the bottom; at the bottom it has another screw-shell socket into which may be put the lamp that has been removed to make room for the device. Thus, use of the latter does not prevent use of the lamp as well.

The transformer has very small magnetizing current, consequently its use involves almost a negligible amount of energy consumption. It is well built with a core of good steel, well insulated windings and filled with a moisture-proof sealing compound. The casing is of black japanned steel, and porcelain surrounds the screw shells of the socket. Being so easily installed and readily sold over the counter, it should find very extensive use.

Electric Bench Saw for Woodworking Shops.

One of the latest machines on the market is the Wallace bench saw shown in the accompanying illustration. This machine makes possible the application of an idea which is sure to increase the output and greatly reduce the cost of pattern, cabinet or carpenter work and in fact any woodwork, for it is possible to do the work at the bench, thus saving a great amount of time which must now be wasted running to and from stationary machines and at the same time doing this work on a machine.

As the name implies, the Wallace bench saw is a bench tool, portable and designed to operate on the electric lighting circuit, yet it has ample power to take a full 2-inch cut through the hardest of wood, making it possible to use this machine for 80 per cent, if not all, of the work generally done by hand or on the big circular saw in a pattern, cabinet, jobbing and contracting carpenter shop or woodworking plant.

Several new features are incorporated in the designing of the Wallace bench saw which are certain to be time savers. For instance, this machine overcomes the decided disadvantages of the usual design. To cut at an angle the saw is tilted instead of cocking up a heavy table. This, as will be readily realized, makes it possible to cut long stock without fear of breaking the angle by the stock coming in contact with the floor, as is so often experienced when attempting to cut long stock on a table-tilting machine. Other advantages accruing from this saw tilting design are, first: the operator is working on a table which is always in a horizontal, efficient and safe position; second, the exact angle of cut is set without much difficulty by simply spinning the handwheel until the angle desired is registered on the dial in the front of the machine; third, no time is wasted adjusting the machine, for, as is often the experience when attempting to set a table-tilting machine, the heavy table drops a few degrees before the screw is tightened, making it necessary to do the work over again or if the drop goes unnoticed the cut is taken and the stock either spoiled or the job must be done over.

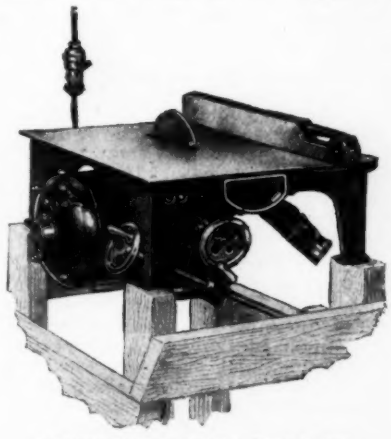
This tilting mechanism is controlled by a handwheel mounted on a perfectly cut screw acting on a swivel nut. This swings the cradle in which the motor driving mechanism and saw are mounted. While it is very easy to make this adjustment, the screw holds the cradle rigidly.

The saw can be raised and lowered so as to cut or groove the stock any depth up to 2 in. The raising and lowering mechanism is similar to the tilting mechanism and is controlled by a handwheel in the front of the machine.

A ½-hp. General Electric motor supplies ample power, due to the care with which this saw was designed. The motor is fitted with a ball bearing which operates as a thrust bearing when tilted for angle cutting.

The cross-cut fence is built into the machine but can be thrown under the table when not in use. It is, however, never off of the machine and lost. The rip fence is finished on both sides so that it can be used on either side of the saw. This fence is of the box type and is clamped to both sides of the table by means of a handle conveniently located. This handle works on an eccentric and locks by going over the center of the eccentric.

The Wallace shutter saw guard will also prove a great factor in increasing the efficiency and cutting expenses with this Wallace bench saw. This guard is



Wallace Motor-Driven Bench Saw.

built into the machine, and for that reason is always on guard. This guard slips back as the stock goes through and is so cleverly designed that it never interferes with the efficient operation of the bench saw.

It not only protects the operator's hands, but prevents two other causes for accidents which cause more losses than actual cutting—that of catching the tail end of the stock in the back of the saw or catching the waste stock in the teeth of the saw and having it shoot into the abdomen of the operator. The saw guard eliminates all three causes and for that reason is bound to save an incalculable amount of time and damages. This guard is as ingenious and thorough in its protection as the flap and shutter guard used on the Wallace bench planer.

The Wallace bench saw is made by J. D. Wallace & Co., 1401 West Jackson boulevard, Chicago.

Trade Activities

Personnel of Wellman-Seaver-Morgan Co.—Duntley-Dayton Takes Over Dayton Pneumatic Tool—Valuable Literature

Duntley-Dayton Co., Chicago, manufacturer of portable electric drills and grinders and a complete line of accessories, has taken over the entire output of the Dayton Pneumatic Tool Co., Dayton, Ohio, and announces its entry into the pneumatic tool field. W. O. Duntley, former president of the Chicago Pneumatic Tool Co., is president of the new company, and his son, Capt. C. A. Duntley, is vice-president. The Eastern offices of the company are located at 295 Fifth avenue, New York, and the Philadelphia branch is in the Commercial Trust building, of that city.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., is distributing the 1919 edition of its wiring device catalog written in Spanish. It lists and illustrates the majority of the C-H wiring devices shown in the 1919 English catalog. C-H feed-through switches are illustrated and described on pages 10 and 11 of the Spanish edition. Notably among these is the nationally advertised Seventy Fifty switch for use on cords of electrical devices. Push button operated surface snap switches are shown on page 14, while the next page illustrates and lists the complete line of porcelain and brass shell pendent switches. The Spanish catalog comprises 24 pages, 8 by 10½ in. and is bound in a striking orange buff cover. It is intended for distribution to the Central and South American trade.

Quigley Furnace Specialties Co., 26 Cortland street, New York, comes out with a bulletin of great moment to the engineering and industrial world. It is upon the subject of preparing, distributing and burning powdered coal. Nothing is more essential to the conservation of coal than an understanding of the methods of burning it in pulverized form. Quigley Bulletin No. 11 is one of the best treatises on the subject yet to appear. Quigley methods are advanced and complete. They contemplate not only the installation of a clean, dustless pulverizing plant, but an air transport system, in which the pulverized fuel is weighed and transmitted under air pressure, through small pipes to the points of application. The coal passes through these pipes as a fluid, unmixed with air and consequently with perfect safety. At the furnaces, boiler plant or industrial, there are approved devices for feeding with exact control of fuel and air to obtain perfect combustion. But the bulletin should be read to appreciate the simplicity of the system. Individual parts of the system are described and illustrated, and additional views of actual installations are added, in each chapter or division to bring out more clearly the practice involved in each feature of the equipment.

Wellman-Seaver-Morgan Co. Elects Officers.—At the annual meeting of stockholders of the Wellman-Seaver-Morgan Co., at the general offices of the company in Cleveland, Ohio, on Feb. 18, the retiring board of directors, comprised of the following, were re-elected: Edwin S. Church, F. E. Borton, W. H. Cowell, F. B. Richards, S. T. Wellman, E. H. Whitlock, S. H. Pitkin, Francis Seiberling and F. A. Seiberling. Immediately after the meeting of the stockholders, the annual meeting of the board of directors was called and the following officers elected: Edwin S. Church, president and general manager; S. H. Pitkin, vice-president; George W. Burrell, second vice-president, and W. H. Cowell, secretary and treasurer. Mr. G. W. Burrell, the newly elected second vice-president of the company, has been in the continuous employ of

George W. Burrell.

the Wellman-Seaver-Morgan Co. for 21 years, and in this new capacity will have entire charge of the company's works at Cleveland and Akron. He was born in 1871 and received his education in the public schools of Cleveland. Leaving school at the age of fourteen, Mr. Burrell learned the machinists' trade and was employed in machine shops for five years, during which time he studied evenings in preparation for college, entering the Ohio State University in 1891 where he took the three years' course in mechanical engineering. In 1897 he became connected with the Wellman-Seaver-Morgan Co. and has subsequently occupied the following positions: draftsman, inspector, chief inspector, assistant purchasing agent, assistant secretary, assistant works manager, which office he held for 14 years, and latterly manager of works, to which he was appointed in May, 1917.

Electrical Engineers Equipment Co., Chicago, designer and builder of power plant appliances, announces the appointment of William H. Fernholz as one of its district representatives. Mr. Fernholz will make his headquarters at the Mack Building, Milwaukee, Wis. and will have as his territory the state of Wisconsin.

Benjamin Electric Manufacturing Co., Chicago, is sending out to the dealers a very attractive circular, portraying the many applications of the Benjamin Two-Way plug in the home. The circular is a reproduction of an advertisement appearing in the Feb. 15 issue of the Saturday Evening Post, one of many powerful sales-making advertisements which will follow in the Saturday Evening Post and other strong magazines. It may be used as a poster and is bound to bring the dealers many plug buyers.

National X-Ray Reflector Co., Chicago and New York, has just completed a large and splendid volume of 246 pages entitled "Lighting from Concealed Sources." This has been prepared to furnish technical data and suggestions on lighting to architects, lighting specialists, contractors and also to large users of light. The volume has been compiled by the engineering department of the company and is very profusely illustrated, there being some 480 ordinary illustrations and a very large number of full page charts, with details and views of interesting installations. There are also numerous cuts of X-Ray reflectors and their distribution curves, method of mounting, etc. A better idea of the scope of this volume can be obtained by the following condensed summary of the principal chapters in its contents: These include the history of lighting by means of the X-Ray reflector equipment; discussion of the correctness of the principle of lighting from concealed sources; control of light and the laws of reflection; general principles of indirect lighting; planning indirect lighting; applications of indirect lighting to a large variety of classes of interiors; lighting from other than ceiling outlets; the Curtis portable lamp for obtaining either indirect, direct, or a combination of these kinds of lighting; general uses of direct lighting; planning direct lighting; application of direct lighting to many varieties of interiors and a few exteriors; show-window lighting; planning show-window lighting; show-case and wall-case lighting; flood lighting and units for use therein; applications of flood lighting; bank-desk lighting; illumination data, definitions of terms, etc. This book is doubtless the most complete and most elaborately illustrated that has ever been published by any commercial lighting organization.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Bangor, Me.—During this year the Bar Harbor & Union River Power Co. is planning to install at its plant in Ellsworth a 3000-kv-a. water wheel unit. Three water wheels of a capacity of 250 hp. each will be installed in the Veazie plant of the Bangor Railway & Electric Co.

Bristol, Vt.—Hortonia Power Co., Brandon, is having plans prepared for the construction of a new extension to its local hydroelectric power plant, to provide for increased operations.

Richford, Vt.—Vermont & Quebec Power Corporation plans the installation of a 500-kv-a. unit at its central plant at Richford. The company also proposes to build a new plant on its water power holdings on the Missisquoi river, constructing a dam, power house and transmission line. The power to be developed from this plant is 1500 hp. The transmission line, which will be of 13,000-volt capacity, will extend a distance of from 15 to 22 miles. It is expected this work will be completed by October of this year.

Clinton, Mass.—Damage amounting to approximately $50,000 was caused recently at the power plant and office building of the Metropolitan Water and Sewerage Commission, due to breakage in one of the turbines at the plant, which allowed about 2,000,000 gallons of water to escape before the flow could be shut off.

Westfield, Mass.—Plans are under consideration for the installation of a new local fire alarm signal system.

West Springfield, Mass.—The Town Commission is considering plans for the installation of a new heating plant, to be used for municipal service.

Worchester, Mass.—The city is considering plans for the installation of a new electric street-lighting system in Plantation street.

Worchester, Mass.—The Ordnance Department has awarded a contract to the Thomson Electric Welding Co., 3 May street, for furnishing electric welding adapters and boosters, at $120,000.

Providence, R. I.—The City, Board of Contract and Supply, is having plans prepared for the installation of a new central heating plant.

New York, N. Y.—Fire recently damaged the stock and machinery of Stanley & Patterson, Inc., 398-408 Washington street, manufacturer of electrical supplies.

New York, N. Y.—A. B. C. Arc Lamp Co. has filed notice of the dissolution of the company.

New York, N. Y.—R. R. Smith, consulting engineer, 50 East 42nd street, is in the market for one shape furnace and one plate furnace with two motor-driven blowers, one hydraulic ram, eight forge fires and one 1000-lb. steam hammer.

Port Henry, N. Y.—Port Henry Lighting, Heating & Power Co. is understood to be considering plans for the construction of a new hydroelectric power plant to be located in the vicinity of Millbrook, N. Y. I. M. Frost, Rutland, Vt., is vice-president of the company.

Syracuse, N. Y.—The Board of Contract and Supply has awarded a contract to the Crouse-Hinds Co. for furnishing electrical fixtures required by the Bureau of Water for municipal purposes. The city is also planning for the installation of new electric motor equipment, etc., in the sewage pumping station in the Seventeenth Ward.

Syracuse, N. Y.—Following the recent complaints against the Syracuse Lighting Co. by a number of its customers of alleged overcharges for service, Mayor Stone will appoint a special committee to arrange a conference with James C. Delong, president of the corporation, on March 3, to provide for investigation and adjustment.

Watervliet, N. Y.—Ludlum Steel Co., 2 Rector street, New York, has had plans prepared for the construction of a one-story brick boiler plant at its local works, to provide for increased capacity. Douglas Sprague, 39 Cortland street, New York, is engineer for the company.

Elizabeth, N. J.—Considerable new electrical equipment will be required by the Elizabeth General Hospital, East Jersey street, in connection with the proposed construction of a new six-story brick and stone hospital, to be provided with two six-story and one four-story wings, estimated cost about $500,000.

Jersey City, N. J.—The Board of Chosen Freeholders has completed plans for the construction of the proposed one-story and basement reinforced concrete power house, heating and lighting plant, about 95x107 ft., to be located at the county institution, Laurel Hill. Oscar L. Auf der Heide, Court House, is chairman of the board.

Keyport, N. J.—The Borough Council has approved an appropriation of $5,816.22 to provide for lighting purposes, as requisitioned in the annual budget for 1919.

Newark, N. J.—The City Commission is considering plans for the installation of additional lighting units at Mulberry and Market streets. It is also understood that the city is planning for the replacement of lights in the vicinity of the Court House removed during the "lightless night" period.

Newark, N. J.—Considerable new electrical equipment will be required in connection with the construction of the new four-story industrial school by the Board of Education, to be located on Sussex avenue. Plans for the structure, which is estimated to cost approximately $400,000, are now being prepared.

Newark, N. J.—William J. Rainaud Lamp Co. has filed notice of authorization to operate at 121-23 Lafayette street. William J. Rainaud, 308 Lafayette street, heads the company.

New Brunswick, N. J.—The County Board of Freeholders is planning for the installation of new engine equipment, air compressor, and 3x5-in. pump at the county workhouse.

Pequannock, N. J.—The Township Committee has completed negotiations with the Board of Works, Pompton Lakes, whereby electric service for lighting purposes will be supplied by the latter from the new power plant now in course of construction at Pompton Lake.

Phillipsburg, N. J.—The Town Commissioners have approved the appropriation of $12,125 in the annual budget for 1919, to be used for street-lighting purposes for this period.

Succasunna, N. J.—Plans are under consideration for the installation of a new electric street-lighting system in Roxbury Township. Power for operation will be supplied by the New Jersey Power & Light Co., Dover.

Trenton, N. J.—The city is considering plans for extension and improvements in the electric street-lighting system in the North Trenton district.

Trenton, N. J.—Trenton & Mercer County Traction Corporation is planning for improvements and extensions in its traction system during the coming spring, including the construction of a new extension commencing at the Market street division and extending to the Municipal Dock, the work being estimated to cost about $80,000. Rankin Johnson is president.

Trenton, N. J.—A bill has been introduced in the New Jersey Legislature, now in session, by Assemblyman Gill, of Trenton, providing for public ownership of traction corporations in the event that the electorate voted in favor of the municipal ownership or control.

Ephrata, Pa.—According to reports received, the Tri County Electric Co. will increase the capacity of its line 500%, making the entire system three phase. This will require a separate wire of about six miles, the present system being three-phase with the exception of one spur.

Bethlehem, Pa.—In connection with the construction of the proposed new local plant of the Traveler Tire & Rubber Co., 819 North Broad street, Philadelphia, to cost in excess of $250,000, plans have been prepared for the construction of a one-story power plant, about 50x75 ft. in size, for operation.

Blain, Pa.—The Town Council has recently completed extensions in the municipal electric light system.

Bristol, Pa.—Contracts have been signed by the East Pennsylvania Gas & Electric Co. for a new 5-ft. water gas set with necessary auxiliaries, which will be installed shortly. This work will require additional buildings and pipe work to tie in with the present gas generator and apparatus. The company also plans to install several miles of high pressure gas mains to reach the center distribution from the outlying districts in the vicinity of Bristol, and also has in view a continuation of the work started during the war and extending certain 13,000-volt lines in and around Bristol.

Hanover, Pa.—Hanover Light, Heat & Power Co. has prepared plans to install a 1,000-kw. turbogenerator and surface condenser with a suitable spray cooling system to care for its increasing load. A new switchboard adequate to meet the needs of the plant is now being installed. The company also intends to revamp certain existing distribution lines by raising the voltage 13,000 volts to care for the growing load in the country districts.

Latrobe, Pa.—Latrobe Water Co., recently acquired additional land for the purpose of constructing a larger and more suitable reservoir for meeting the growing needs of Latrobe. In addition to a dam which will be required to impound the water, there will also be required six or seven miles of pipe line of 24-in. pipe to tie in the new reservoir with the existing one.

Philadelphia, Pa.—Jacob Hornung, 2125 West Clearfield street, has awarded a contract to the P. Haibach Contracting Co., Twenty-sixth and Thompson streets, for the construction of a one-story brick refrigerator and ice plant, to cost $7,700.

Philadelphia, Pa.—Wark & Co., Philadelphia, have submitted the low bid to the Government, Bureau of Yard and Docks, for the construction of the proposed substation at League Island Navy Yards, at $7,695.

Philadelphia, Pa.—Air Reduction Co., Germantown and Sedgley aves., has awarded a contract to the Cooling Tower Company, 15 John street, New York, for the construction of a new cooling tower at its plant, to cost about $6,000.

Pittsburgh, Pa.—Devon Electric Co. has leased the three-story building at 613 Liberty avenue, for a term of years, at an aggregate rental of $57,000, to provide for extensions.

Pittsburgh, Pa.—Hein Co., 34 Isabella street, has awarded a contract to George Enzian & Co., 802 Madison avenue, for the construction of a two-story addition to the power plant at its works, estimated to cost $25,000.

DATES AHEAD.

Minnesota Electrical Association. Annual convention, St. Paul, March 18-20. Secretary-treasurer, F. C. Hoffman, St. Paul, Minn.

Society of Industrial Engineers. National conference, New York City, March 18-21. Secretary, Irving A. Berndt, 327 South La Salle street, Chicago, Ill.

Associated Manufacturers of Electrical Supplies. Annual meeting, New York City, March 23. Secretary, Chas. E. Dustin, New York.

Wisconsin State Association of Electrical Contractors and Dealers. Annual convention, Hotel Pfister, Milwaukee, Wis., March 24-28. State secretary, John A. Piepkorn, 108 Sycamore street, Milwaukee, Wis.

Wisconsin Electrical Association. Annual meeting, Milwaukee, March 25-27. Secretary, J. P. Pulliam, 1408 First National Bank building, Milwaukee.

Tri-State Water and Light Association. Annual meeting, Greenwood, S. C., April. Secretary-treasurer, W. F. Steiglitz, Columbus, S. C.

National Fire Protection Association. Annual meeting, Ottawa, Ont., May 6-8. Secretary-treasurer, Franklin H. Wentworth, 87 Milk street, Boston, Mass.

National Electric Light Association. Annual convention, Atlantic City, N. J., May 19-23. Secretary, T. C. Martin, 33 West 39th street, New York City.

Illinois Association of Electrical Contractors and Dealers. Summer convention, Decatur, Ill., June. Secretary, N. M. Blumenthal, Chicago.

American Society of Mechanical Engineers. Spring meeting, Hotel Statler, Detroit, Mich., June 17-20. Secretary, Calvin W. Rice, 29 West 39th street, New York City.

Ohio Electric Light Association. Annual meeting, Cedar Point, Ohio, July 15-18. Headquarters, Breakers Hotel. Secretary, D. L. Gaskill, Greenville, Ohio.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., September, 1919. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

York Haven, Pa.—Fire recently destroyed a section of the plant of the York Haven Water & Power Co. It is understood that the company will make immediate repairs.

Wilkes-Barre, Pa.—Wilkes-Barre Co. will install two 500-hp. boilers at its station No. 1. The company may also purchase a 5000-kw. turbine for its plant.

Wilmington, Del.—Standard Kid Manufacturing Co., Fourth and Monroe streets, is considering the construction of a one-story steam-operated power plant, about 40x60 ft., to be known as Unit No. 3.

Baltimore, Md.—The city is planning for the construction of a new underground conduit system to replace the present overhead electric wires. It is also proposed to extend the present system into the Annex.

Washington, D. C.—Potomac Electric Power Co. has had plans prepared for the construction of an extension to its turbine room to provide for the installation of a 20,000-kw. turbogenerator with condenser and auxiliary equipment. The company recently completed the installation of a new 15,000-kw. turbogenerator, six boilers, condenser, coal and ash handling equipment, etc.

Clifton Forge, Va.—Virginia-Western Power Co. is completing the installation of a new steam-electric power plant and a high tension transmission line.

Newport News, Va.—Newport News & Hampton Railway, Gas & Electric Co. purposes to expend about $25,000,000 for new construction work this spring. Address Frank B. Lawton, manager, gas and electric department.

Norfolk, Va.—In connection with the proposed erection of a quarantine station by the Government, plans have been prepared for the installation of a new electric light system.

Clay, W. Va.—Clay Utility Co. is considering plans for the immediate construction of a local transmission system and electric substation.

Shelby, N. C.—Double Shoals Cotton Mills will enlarge and improve its plant; a machine shop will be installed and an electric light system for the mill village constructed.

Wilmington, N. C.—Tide Water Power Co. has expended considerable money in improving its plant, including a 2,500-kw. turbine complete with barometric condenser; two 600-hp. Babcock & Wilcox boilers equipped with superheaters, soot blowers and Westinghouse underfeed stokers, one Cochrane 5000-hp. feed-water heater, and two 1500-kw. transformers together with switchboard and apparatus. All this equipment has been installed in the power house to provide facilities for the shipyards.

Albany, Ga.—Georgia - Alabama Power Co. is understood to be planning for extensive improvements and extensions in its hydroelectric power development on the Flint river, to provide increased capacity.

Talbotton, Ga.—J. W. Jordan is chairman of the purchasing committee to secure an electric lighting plant.

Pensacola, Fla.—The Navy Department, Washington, will expend $85,000 to improve the electric power plant.

NORTH CENTRAL STATES.

Alliance, Ohio.—On March 18 the question of issuing municipal light bonds will be submitted to vote. Address city clerk.

Columbus, Ohio.—Columbus Railway, Power & Light Co. will construct 6.75 miles of track on a single track basis. This will be reconstructed with the modern improved type of track construction and paved with granite and brick, which work will be done in connection with the city street improvements. Address C. C. Slater, general superintendent.

Coshocton, Ohio.—Ohio Service Co. is installing an additional 4000-kw. turbine at its Plant No. 2, at New Philadelphia, and has just completed the installation of an additional 500-hp. Stirling boiler with Type E stoker. The company contemplates the installation of a new switchboard for its Dennison substation, also the construction of a parallel circuit of 33,000 volt transmission lines from New Philadelphia to Dennison and from Newcomerstown to Cambridge. Address C. H. Howell, manager.

Elyria, Ohio.—By agreement with the War Department, work will be completed as rapidly as possible on the new 8000-kw. power station of the Lorain County Electric Co. Most of the essential materials are on the ground for the work. This represents the first unit in the new modern power plant, which will be completed about July 1.

Sandusky, Ohio.—Sandusky Gas & Electric Co. is installing stokers under its boilers, adding an additional 400-hp. boiler, installing coal handling apparatus and a new switchboard. A high tension line connected to the service of the Lake Shore Electric Railway is being placed in operation. This line will connect up an electric steel furnace for one of its customers, requiring about 1000 kw.

Springfield, O.—Springfield Light, Heat & Power Co. will spend approximately $20,000 for construction purposes this year. This will cover principally the extension of its service to new consumers and improvements to its existing equipment.

Warren, Ohio.—Trumbull Public Service Co. is proceeding with the installation of an additional 12,500-kw. turbine, and it is expected this machine will be in operation by May 1.

Brazil, Ind.—In order to decide which kinds of lights to specify in the new contract for the lighting of the city streets of Brazil, bids for which will be advertised in a short time, the city will try out two large incandescent lights of the nitrogen which, it is claimed, have many advantages of the carbon arc lights. The present contract of the Terre Haute, Indianapolis and Eastern Traction Co. for the city lighting expires April 1, 1920 and as the law requires that the bids must be advertised for at least a year before the contract is let, the bids will be advertised for soon. It is understood that bids will be asked on the two styles of lamps for three, five and ten years.

Carthage, Ind.—Carthage Board & Paper Co. will erect a reinforced building, 100x265 ft. in size, to cost $50,000, as an addition to its present plant.

Clinton, Ind.—A new $150,000 court house will be erected in this city if 65% of the voters of Vermilion county favor the removal of the county seat from Newport to Clinton.

Evansville, Ind.—The directors of the Chamber of Commerce are considering endorsement of the sale of $125,000 bonds for a traction line to Cynthiana and New Harmony. C. J. Seibert and Ollie Heerdick, appearing for the company, said that they had $165,000 of bonds sold and had a construction company ready to build the road for $200,000.

Goshen, Ind.—Hawks Electric Co. has increased its capital stock from $200,000 to $300,000.

Indianapolis, Ind.—Merchants Heat & Light Co. has had plans prepared for improvements in its building at 744 Washington avenue.

Indianapolis, Ind.—Announcement is made that the Public Grain & Elevator Co. will build a grain elevator, capacity 500,000 bushels. The company, recently incorporated with capital of $300,000, will remodel mill at Edinburg, install new machinery and maintain output of 500 barrels of flour a day.

Muncie, Ind.—George R. Roberts will erect a three-story business block, 60x130 ft. in size, to replace structure known as Stillman's department store which was recently destroyed by fire.

Rushville, Ind.—Carthage Board & Paper Co., Carthage, Ind., will build an addition, reinforced concrete, 100x 265 ft. in size, to cost $50,000 and will install equipment worth $150,000.

Tell City, Ind.—Tell City Water & Light Co. has petitioned the Indiana Public Service Commission for permission to sell $16,000 common stock. The company plans to make a number of improvements.

Aurora, Ill.—Western United Gas & Electric Co., which serves a wide territory in and around Aurora, has never taken advantage of the increased rates during the duration of war which were allowed by the Illinois Public Utilities Commission in making property owners and new consumers pay for gas and electric extensions. Under a ruling of the Commission the new consumer was forced to pay for new extensions of gas and electric service. The Commission has now ruled that funds advanced for these extensions must now be repaid. The Western United Gas & Electric Co. has never made this additional charge and will not be compelled to make a return of the same to the new consumers.

Byron, Ill.—The city of Byron has asked Adam Gschwindt, manager of the Rockford Electric & Power Co., to build a line to Byron and furnish the city with electric power. Address Mayor Albert Johnson.

Chenoa, Ill.—Farmers south of this city will extend service wires from the lines of the Illinois Traction System in this city. Address George G. Brown, Chenoa, Ill.

Chicago, Ill.—Marshall Field & Co. have purchased factory building at West 47th and Whipple streets, to be equipped for manufacturing burlap bags. The boiler plant is to be in a separate building and the power will be electrical, generated by means of individual motors.

Chicago, Ill.—Chicago Telephone Co. has purchased property in Federal street near Harrison street. The property adjoins the Wabash exchange of the company and will be improved with a building to serve as an addition to the exchange.

Decatur, Ill.—Staley Manufacturing Co. is building a machine shop, 240x 50 ft. in size, fireproof with steel and brick walls.

East Moline, Ill.—Root & Van Dervoort Engineering Co. has acquired 61 acres of land as future site for shop and foundry buildings.

Griggsville, Ill.—The board of education will erect $75,000 high school building to replace one destroyed by fire.

Mt. Vernon, Ill.—Numerous improvements in its central station will be made by the Citizens' Gas, Electric & Heating Co. A new 450- kv-a. unit will be installed within 90 days. Address Frank M. Stone, manager.

New Athens, Ill.—Work of rebuilding powerhouse for the New Athens Power Co. has been begun. The mill was recently damaged by fire, the engine house being completely gutted and the machinery considerably damaged.

Quincy, Ill.—Board of education plans erection of new Irving public school at cost of $115,000.

Rockford, Ill.—Considerable construction work has been planned for the Spring by the Rockford Electric Co. The company will install a new 7500-kw. Curtis turbine, and will make various changes in coal handling machinery and switching arrangements for the receipt of coal. Considerable extension to its present distribution lines is also being contemplated.

Rock Island, Ill.—Universal Tractor Co. has taken out a permit to build a $50,000 addition to its plant.

Springfield, Ill.—Under a new order the Illinois Public Utilities Commission has set aside the war time rule forbidding electric and gas companies to make free extensions of service. Under the war time rule new customers asking service were required to advance the cost of the connection, which amount would be paid by the utility in installments.

Springfield, Ill.—The council is planning to extend the municipal lighting plant and install a city heating plant. Charles T. Baumann, Mayor.

Springfield, Ill.—Chapin Electric Garage has added to its service the Atwater-Kent ignition service and parts.

Varna, Ill.—The substation of the Central Illinois Public Service Co. has been destroyed by fire.

Winnetka, Ill.—The council is planning to place all overhead lighting and telephone wires in conduits and eliminate all electric and steam railroad grade crossings within the village limits. Address H. L. Woolhiser, village manager.

Boyne City, Mich.—The city council has under advisement the installation of a boulevard lighting system on five blocks of the main streets.

Detroit, Mich.—Public Lighting Commission is planning to expend approximately $500,000 during the ensuing year for the construction of conduits, underground cable, pole lines and street-lighting equipment.

Hancock, Mich.—The present lighting system is unsatisfactory. Address W. N. Galdsworthy.

Milford, Mich.—Milford Electric Co. has under advisement the development of two water powers this coming season.

Peck, Mich.—The question of a municipal lighting plant is being considered by the council. Address village clerk.

St. Paul, Minn.—Swift & Co. are adding 229 hp. to their power installation at the South St. Paul stock-

yards, which is served electrically by the Northern States Power Co. The growth of population due to the new Armour packing plant at So. St. Paul has been such that the community is suffering from a scarcity of dwellings. One concern plans the construction of 200 new houses this year.

Carrollton, Mo.—Water, Light & Transit Co. plans to expend $3000 to improve its plant. Address H. W. Graham, manager.

Eldon, Mo.—N. E. Harvey proposes to install a new electric light plant, Duplex three-phase, and to furnish a day and night current. The new plant is estimated to cost about $15,000. He has offered to furnish 80 street lamps to the city at a cost to the city of $200 per month.

Kansas City, Mo.—Considerable construction work is contemplated by the Kansas City Light & Power Co., the principal item being the completion of the new power plant erected in Kansas City. The plant consists of two 20,000-kv-a. turbine units, together with the 13,200-volt underground transmission system connecting this plant with the various substations. Two new substations are being erected.

Marshall, Mo.—Henrici-Lowry Engineering Co., 222 Commerce building, Kansas City, Mo., has prepared plans for a $75,000 electric light plant. Bids will be received about March 1. Address E. H. Mitchell, mayor.

St. Joseph, Mo.—City contemplates bond issue for extension of electric light service. The proposed bond issue is meeting with favorable consideration on the part of the voters.

Ottawa, Kans.—The City Water and Light Department will be in the market for new equipment shortly, including a new generating unit with condensing equipment for the electric plant. Specifications for a unit of 500 kw. or larger capacity are now being prepared. Bids on steam engines and turbines will be considered. Address W. O. Myers, superintendent.

Topeka, Kans.—The indeterminate franchise bill introduced in both branches of the Kansas legislature is now out on the floor in both branches. The house committee has reported favorably and the bill will be ready for consideration in a few days.

Topeka, Kans.—An enabling act has been introduced into the Kansas legislature for building a bridge across the Kaw river between Rosedale and Kansas City.

Wichita, Kans.—A petition has been granted to the property owners for a white way lighting system on First street from Main to Lawrence.

Arapaho, Neb.—Engineers Grant & Fulton, Lincoln, Neb., are preparing plans for a hydroelectric plant to be erected by the city of Arapaho and the Arapaho Milling Co.

Ashland, Neb.—Ashland Light, Mill & Power Co. has under consideration the improvement of its dam and the construction of a new wheel pit, also the installation of a new water wheel with a direct connected generator and water wheel governor. Other minor improvements will also be made.

Beatrice, Neb.—Plans are under consideration by George Steinmeyer, Beatrice, for constructing hydroelectric plant on Blue river, near Barneston, 20 miles south of Beatrice. Estimated cost $125,000.

Lincoln, Neb.—The Nebraska legislature has authorized the erection of a new state capitol to cost $5,000,000.

Plainview, Neb.—The city council has decided to engage an engineer to make investigations and prepare estimates for enlarging the municipal electric light plant and installing heating plant.

Plymouth, Neb.—The city is planning to install electric lighting system. Current will probably be secured from Fairbury or Beatrice.

Sterling, Neb.—Engineers Grant & Fulton, of Lincoln, have prepared estimates for electric light system. Bids will be called for. C. H. Johnson, city clerk.

Wymore, Neb.—Franchise has been granted to the Nebraska Gas & Electric Co. for furnishing the city with electricity for five years.

Columbia, S. Dak.—Bonds to the amount of $15,000 have been authorized to install municipal electric light plant.

Doland, S. Dak.—A stock company will be organized to install electric lighting system.

Watertown, S. Dak.—A city bond issue of $175,000 for the construction, operation and maintenance of a municipal light and power plant was authorized recently.

White Butte, S. Dak.—A telephone company has been organized to build telephone system, to extend lines to connect with the town of Lemmon. Address R. E. Hughes, president, White Butte, S. Dak.

Stanley, N. Dak.—Public Utility Co. will be in the market in about 90 days for line material, generators and engines, switchboard and equipment and a. c. meters. Address R. F. Wheeland, manager.

Walla Walla, N. Dak.—A new 15-hp. unit will be installed in the electric power plant to give 18-hour service.

SOUTH CENTRAL STATES.

Lexington, Ky.—Lexington Utilities Co. is considering the rebuilding of a part and possibly the whole of our municipal lighting system of approximately 700 lamps, changing from the present series multiple system to straight Mazda lamps. In addition, the company will make numerous extensions to its consumers' lighting and power circuits that are required from time to time.

Louisville, Ky.—The commercial department of the Louisville Gas & Electric Co. during the week ended Feb. 15 secured 45 new electric light and power customers with 17 kw. of lighting and 210 hp. in motors, and contracts were closed for wiring 16 already built houses. New business connected to the company's lines shows an increase of 18 customers with 166 kw. of lighting. Output of electric energy was 23.4% greater than for the corresponding period a year ago.

Louisville, Ky.—Rural Light & Power Co. has filed notice of an increase in its capitalization from $6,000 to $15,000, to provide for expansion.

Bessemer, Ala.—American Telephone & Telegraph Co. has recently acquired property, about 75x150 ft., and is understood to be planning for the erection of a new building to cost about $60,000.

Birmingham, Ala.—An addition to the gas plant of the Birmingham Railway, Light & Power Co., Third avenue, near Thirteenth street, to cost upwards of $75,000 is to be built at once. Other betterments and improvements and enlargements are said to be contemplated and soon will be placed under actual construction, the understanding being that more than $100,000 is to be spent at once. Address Receiver Lee C. Bradley.

Union Springs, Ala.—An ordinance is before the council to provide for an issue of $10,000 light and water improvement bonds. Address I. B. Fragin, mayor.

Bay St. Louis, Miss.—Plans for the construction of a municipally owned electric interurban railway from New Orleans to Pascagoula, and possibly to Mobile, were taken up at a conference held at Bay St. Louis, Miss., Feb. 27 and 28.

Port Clinton, Miss.—The city has had plans prepared for the construction of an electric light system. It is understood that a bond issue for $25,000 to provide for the work has been authorized.

Shelby, Miss.—Shelby Light & Power Co. expects to complete its line to the towns of Mound Bayou and Merigold this spring. This line is 9 miles, 6900 volts primary.

Fort Smith, Ark.—A contract has been closed with the Missouri-Arkansas Oxygen Co. whereby the Fort Smith Light & Traction Co. will furnish current for 200 hp. in motors to operate the oxygen plant.

Pine Bluff, Ark.—Arkansas Light & Power Co. has increased its capital stock from $2,500,000 to $4,000,000. The increased capital is to provide for the consolidation of the Arkansas Public Service Co. and extensive improvements and repairs in the light company.

Dewey, Okla.—A municipal lighting and power plant is being contemplated.

Duncan, Okla.—The city has completed plans for the construction of a new municipal power plant, about 40 x50 ft., estimated to cost $50,000.

Frederick, Okla.—A white way is being planned on Grand avenue from 7th to 10th streets.

Lawton, Okla.—A spray pond is under construction at the plant of the Comanche Light & Power Co.

Mangum, Okla.—200-kw. direct connects units together with boiler capacity for same are being installed in the plant of the Mangum Electric Co.

Walters, Okla.—Election was held recently to vote $45,000 bonds for waterworks and light extensions.

Amarillo, Tex.—An order is being placed for a 1250-kw. turbine by the

City Light & Water Co. This work will be completed as early this fall as may be possible after delivery of the turbine.

Aransas Pass, Tex.—France & Canada Oil Transport Co. plans to establish an electric light plant here.

Dallas, Tex.—Dallas Power & Light Co. has been granted nine months' extension in which to complete its $1,000,000 schedule of improvements.

Port Arthur, Tex.—Although no large construction work will be undertaken for the present year, the Eastern Texas Electric Co. will make a number of small lighting extensions which have been held up due to inability to secure poles and line equipment. Joseph Bowers, superintendent.

Quanah, Tex.—Quanah Light & Ice Co. is installing 500-hp. Diesel engines in its plant.

Fessenden, N. Dak.—Fessenden Light & Power Co. is arranging for the construction of a 19-mile extension of a high tension line to an adjoining town; also an 8-mile extension of one of its high tension transmission lines into a new territory. The company is endeavoring to interest a third town in connections, which if accomplished will necessitate the addition of a 200-hp. unit.

WESTERN STATES.

Hardin, Mont.—If the State Legislature passes a law permitting an increase in the bonded indebtedness of municipalities, it is likely that Hardin will purchase the electric plant of the Hardin Light & Power Co. It is proposed to issue $9,600 to purchase the concern. It is believed that if the city owns the power plant, the cost of electric current for both lighting and the operation of machinery will be greatly reduced.

Miles City, Mont.—Supt. J. J. McGill of city lighting plant has recommended to city council the expenditure of $45,000 for new equipment.

Breckenridge, Colo.—The city has under advisement the erection of an electric light plant.

Valedon, N. Mex.—Eighty Five Mining Co., Lordsburg, is in the market for a 1000-hp. boiler, a 1000-hp. steam turbine and steam equipment.

Olympia, Wash.—City clerk will open bids March 4 for a motor-driven centrifugal pumping unit of capacity of 800 g. p. m., against a 225-ft. head, requiring a 440-volt motor.

Prosser, Wash.—Pacific Power & Light Co. has plans for important reconstruction work at this place.

Spokane, Wash. — Washington Water Power Co. has completed negotiations for the purchase of the Spokane Heat, Light & Power Co., which has been in the hands of a receiver for a few months past. It is understood that the company will continue the operation of its plant as heretofore, the acquired property to be operated as a subsidiary organization.

Astoria, Ore.—Pacific Power & Light Co. has developed plans for a new light and power plant to meet demands of industrial growth.

Baker, Ore.—About $15,000 will be added to the capital investment of the Eastern Oregon Light & Power Co. during 1919. This amount will be about 50% more than was added in 1918.

Klamath Falls, Ore.—Big Lakes Box Co. will increase its capacity and change from steam to electric power. The factory and power plant changes are being made under direction of F. Hill Hunter, of the Sawmill Engineering & Construction Co.

Lebanon, Ore.—Lebanon Light & Water Co. will erect a new plant in the near future. The old plant will be used for a pumping station and the new one will provide electricity for the city.

Brigham City, Utah.—The city contemplates an electrical installation to cost approximately $12,000. A new series lighting system will be installed in the business district of approximately four blocks of steel pole lighting. A new series lighting system of the pendant type will also be installed on five blocks on Main street, north and south of the business district. Poles will be removed from the center of the street and a secondary distribution system from within the blocks over the entire business district will be established.

Salt Lake City, Utah.—The Utah Public Utilities Commission has issued an order to all telephone companies that the rates and charges of service as stipulated by Postmaster-General Burleson should not be recognized in the state. The Commission declared that the Postmaster-General's order was contrary to the Utah laws.

Tempe, Ariz.—The city will hold an election shortly to vote on a bond issue for the construction of a gas and electric light plant.

Calexico, Cal.—Southern Sierras Power Co. has had plans prepared for the construction of a new transmission line extending to Calexico. An appropriation of $15,000 to provide for the work has been approved by the company. E. W. Judy is district manager.

El Centro, Cal.—Holton Power Company has completed arrangements for the remodeling and improvement of its building at Sixth and Main streets.

Eureka, Cal.—Western States Gas & Electric Co. is constructing a branch line to supply the electrical energy requirements of the Humboldt Transit Co.

Fresno, Cal.—San Joaquin Light & Power Co. is understood to have completed arrangements for the immediate construction of a new 20,000-hp. hydroelectric power plant on the San Joaquin river located in the vicinity of Macy Flat. It is understood that the company is planning for the completion of the work by April of 1920. It is said that the company is planning for the erection of a new plant of similar capacity at Dinkey Creek. The work is estimated to cost about $1,750,000. A. G. Wishon is general manager.

Los Angeles, Cal.—Metro Pictures Corporation, Cahuenga avenue and Romaine street, has had plans prepared for the construction of a new one-story reinforced concrete transformer building at 937 Cahuenga ave. The structure will be about 35x40 ft. in dimensions.

San Diego, Cal.—Arrow Packing Co. has recently awarded a contract for the construction of a new boiler plant at its work on Belt street.

San Diego, Cal.—San Diego & Arizona Railway Co. recently awarded a contract for the erection of a boiler plant at Sixteenth and Main street in connection with other improvements, the entire work being estimated to cost $19,527.

INCORPORATIONS

Buffalo, N. Y.—Roche & Banas Electric Co., Inc. Capital, $25,000. To engage in a general electrical contracting capacity. Incorporators: D. Roche, M. G. Roche and A. Banas.

Newark, N. J.—Auto & Electrical Supply Co. Capital, $15,000. To operate at 70 Springfield avenue for the manufacture of electrical supplies, etc. Incorporators: B. N. and Y. Kantor, Irvington; and M. Weinstein, Perth Amboy.

Cavour, S. Dak.—Cavour Light & Power Co. has incorporated with a capital of $20,000 by F. Gellerman, Otto Leather and G. M. Martin.

Preble, Ind.—Preble Light & Power Co. has incorporated with a capital of $8000. Address Jas. Steele, director.

Foreman, Ark.—Foreman Light & Water Co. has been chartered with $25,000 capital stock. The corporation proposes to own, operate and control an electric and power plant.

East Chicago, Ind.—Indiana Electric Service Co. has been incorporated with capital of $10,000 to engage in a general electrical merchandise business. The directors include Samuel Sendek, Phillip N. Sendek, Solomon Frankel and others.

Cooper, Tex.—Cooper Light & Ice Co. has been incorporated here with a capital stock of $50,000 for the purpose of installing an electric light and power plant and ice factory. E. Hendricks is a stockholder.

Poughkeepsie, N. Y.—United Hudson Electric Corporation. Capital, $20,000. To operate a plant for the generation and distribution of electrical energy. Incorporators: E. D. Alexander, T. R. Beal and J. L. Wilkie, 16 West Twelfth street.

PROPOSALS

Pumping Unit.—Sealed bids will be received March 4 at Olympia, Wash., for furnishing an electrically-driven centrifugal pumping unit, to deliver not less than 800 gallons per minute of water against 225 ft. head, motor to be 440 volt, 60 cycle, 3 phase. Address Hiram Dohm, city clerk.

Personal

C. A. Gauss Promoted — N. M. Haralson Takes Charge Atlanta Branch, Haralson Sales Co. — Other Changes

LIEUT. A. E. MORPHY has received his honorable discharge from the army and has resumed his duties as secretary of the Southern California Edison Co. at Los Angeles, Cal.

W. A. LELAND, formerly president of the Tennessee Eastern Electric Co., Johnson City, Tenn., was recently appointed chief engineer and general manager of the Charleston Engineering & Contracting Co., Charleston, S. C.

WILLIAM A. SUMNER, Rockville, Conn., recently discharged from the army with the rank of second lieutenant, has entered the employ of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, where he will specialize on electrical machine designing. Mr. Summer is a graduate of the 1917 class of Sheffield Scientific School, New Haven, Conn.

CHESTER A. GAUSS, publicity manager of the Crocker-Wheeler Co., has been transferred to the sales department of the company and will be temporarily located at Ampere, N. J. The advertising of the concern is now handled by Sherman & Bryan, New York City. Mr. Gauss is a graduate of the 1912 class in electrical engineering of Lehigh University. Following his college work he became connected with the General Electric Co., Schenectady, N. Y., serving in the testing department for several months, and later became one of the technical writers on the publicity staff of the company. In 1914 he tendered his resignation to join the editorial staff of the ELECTRICAL REVIEW. Following some textbook editing for the American School of Correspondence, Mr. Gauss was on the editorial staff of the *Electrical World*, leaving this position in 1916 to become publicity manager of the Crocker-Wheeler Co., in which capacity he has served until his recent promotion. He is prominently identified with the Technical Publicity Association, being a member of its executive committee and chairman of its service committee.

THOMAS F. KELLY, who has so ably served the Dayton Power & Light Co., Dayton, Ohio, as commercial manager, has resigned to accept the position of sales manager for the Dominion of Canada for the Hoover Suction Sweeper Co., Ltd., whose Canadian plant and headquarters are located at Windsor, Ont. This appointment is an unusual business opportunity and carries with it a wide and fertile field in which to work. Mr. Kelly was born in Hamilton, Ont., and entered the central-station business in 1900 as office boy in the employ of the Hamilton Electric & Power Co. He was soon advanced through the various departments and was appointed contract agent of the company in 1907. He continued in this capacity until January, 1913, when he resigned to become sales manager of the Dayton Power & Light Co. While at Hamilton he was very active in civic affairs and in the work of the Canadian Electrical Association and National Electric Light Association in Canada. He was the first chairman of the Commercial Section of the Canadian Electrical Association and organized the Hamilton Electric Light & Power Co. Section of the National Electric Light Association and was elected its first president.

In 1915, when F. M. Tait, president and general manager of the Dayton Power & Light Co., moved his office to New York, Mr. Kelly was appointed commercial manager and in 1916 was a member of its board of directors. Since taking up his residence in Dayton he has been very active in civic affairs and devoted much of his time and effort to the Jovian Order, the Ohio Electric

Thomas F. Kelly.

Light Association and the National Electric Light Association. In 1913 he was appointed chairman of the Committee on New Business Co-operation of the Ohio Electric Light Association and was re-elected chairman in 1914. Mr. Kelly has also been an active member of the National Electric Light Association and has served on many of its committees. At the 1916 convention he was elected a member of the Executive Committee of the Commercial Section and later appointed chairman of the Lighting Sales Bureau and is still serving in that capacity. He served as chairman of the Dayton Power & Light Section, N. E. L. A., during 1913-1914. Early in 1914 Mr. Kelly organized the Dayton Jovian League and also held the office of statesman for Ohio of the Jovian Order during the year 1914-1915. In addition to his activities in electrical organizations, he was an active member of other prominent Dayton clubs and has freely given of his time and talents to promote the interests of the community. Mr. Kelly has a host of friends in the central-station industry, who though pleased to hear of the good fortune that has come to him, will regret to learn that his activities will take him into a different field.

N. M. HARALSON, who has been connected with the Bureau of Aircraft Production for the past 17 months and since June, 1918, has been chief of the Section of Instruments and Armament, New York Office, has resigned his position with the Bureau and has taken charge of the Atlanta branch of the Haralson Sales Co., Inc., headquarters being in Birmingham. Mr. Haralson anticipates extensive business from his new connection in the sales of Midwest-Hill centrifugal pumps, Ideal electrical apparatus, Standard electric time systems and Foxboro recording and indicating gauges. Mr. Haralson was formerly connected with the engineering and sales departments of the General Electric Co. at New Orleans, and Westinghouse Electric & Manufacturing Co. at Philadelphia, this work eminently fitting him to handle his present work in a competent manner.

Obituary.

ELMER J. ROCKE, jobbing sales manager for the Meadows Manufacturing Co., Pontiac, Mich., passed away at his home in that city on Feb. 16 after a brief illness with influenza. He was 26 years of age and is survived by his wife and daughter. Mr. Rocke was a young man of sterling qualities and was held in high esteem by all who knew him.

A. O. DICKER, Illinois district manager for the Luminous Unit Co. and St. Louis Brass Manufacturing Co., St. Louis, Mo., died Feb. 15 at his home in Oak Park, Ill., of influenza and pneumonia. Mr. Dicker was well known among the illuminating men of the Middle West, having been very active in this field for the past six years. During the early part of this period he was in the employ of the Commonwealth Edison Co., of Chicago. In 1914 he resigned his position to become secretary and treasurer of the Electrical Sales Engineers, Inc., acting in this capacity until last summer when he accepted the appointment of Illinois district manager for the above companies, the position he held at the time of his death. Mr. Dicker was a graduate of the University of Michigan, class of 1913, and a member of Beta Theta Pi fraternity. He was also active in the Electric Club of Chicago, the Illuminating Engineering Society and the National Electric Light Association. He was 30 years old and is survived by his wife and one child.

For the Readjustment Period—What?

XXVI.

A Winning Combination

We are faced with self-evident conditions, brought about by the war as well as by the ending of the war.

A good business man, like a good sailor, must be prepared for both calm and storm, and know how to trim his sails to the variables of wind and tide.

Business periods are as the rise and fall of the tide. If the areas of the peaks of prosperity exceed the areas of the valleys of depression, then our business is a progressing, rising tide—otherwise we are retrograding as the falling tide.

The Business growth—the Country's growth and advancement, may be likened to a great engine, the propelling force being Optimism, the governing and limiting means being Pessimism. When the entire engine output is needed to drive the governing means, we face a crash in a cloud of darkness.

Let us give thanks that as a nation we are the world's greatest Optimists.

After every war comes Reconstruction and Reestablishment, the redistribution of the forces of Capital and Labor. These periods—of greater or lesser duration—are fraught with doubts and uncertainties; the needs of labor on one hand, and the timidity of capital on the other. In the end Optimism, combined with good judgment, wins.

There are in every generation a few men who can see farther into the future than it is possible for the great mass of their fellows to see. If the counsel of these few wise ones prevail, then the Reconstruction period is a short one, followed by a rapid rise in business.

We are now just entering the Reconstruction phase. We hope the Nation's leaders in finance, labor and manufacturing will all be wise Optimists. The great value of Foresight is beyond estimate. "Hindsight" is worth nothing per ton.

How far Foresight can be guided by experience—based upon the reconstruction periods following previous wars—is a matter of doubt, as we are today confronted with conditions which are world-wide and of a magnitude heretofore undreamed of, combined with unparalleled problems.

The judgment of a Solomon, the wisdom of Aristotle, the determination of a Caesar, and the strategy of a Foch are needed in the present instance; not to bring back pre-war conditions, for those conditions have gone never to return—but to adjust our channels of thought and mode of life to an entirely new set of conditions. These problems will be solved, and we will readjust our personal and business life to fit the times. With Optimism we will progress and succeed.

C. BREWER GRIFFIN.

This extract from an address delivered by the President of the Automotive Electric Ass'n. at the Hotel Astor, New York, is a tocsin call to the leadership of the nation.

C. A. TUPPER CHICAGO
President INTERNATIONAL TRADE PRESS, Inc.

Financial News

Public Service Has Successful Year.

The Public Service Co. of Northern Illinois was able to increase its net earnings of 1918 over those of 1917, despite the higher costs of labor and coal and other materials. The company's pamphlet report to stockholders showed net earnings before interest charges were $3,632,930, against $3,488,432 in 1917. Larger interest charges, however, slightly reduced the balance available for dividends. The amount earned on the $11,971,600 common stock, after amortization and depreciation charges, was 7.97%, compared with 8.08% on $11,951,600 common stock in 1917.

In the annual report for 1917 it was stated that whatever excess profits tax the company would be required to pay on its earnings for the year 1917 would be charged against the surplus account. In the end, however, the company was not found subject to any excess profits tax.

The income account, with comparisons follows:

	1918.	1917.
Gross earnings	$9,218,884	$8,797,765
Expenses and taxes	5,585,954	5,309,333
Net earnings	3,632,930	3,488,432
Bond and note interest	1,784,796	1,614,867
Net income	1,848,134	1,873,565
Preferred dividends	455,280	455,280
Common dividends	837,662	832,734
Surplus	555,193	585,551
Amortization and depreciation reserve and dis.	438,236	451,591
Balance to surplus	116,956	133,960

The balance sheet as of Dec. 31, with comparison, follows:

ASSETS.

Plants, real estate, etc.	$56,023,961	$53,344,502
Securities with trustee	215,000	227,500
Cash with trustees	9,800	5,992
Securities	323,052	298,916
U. S. treasury ctfs.	662,000	.....
Debent. in treasury	209,700	.....
Material	668,555	816,137
Coke, gas, oil, etc., on hand	243,047	152,643
Coal in storage	362,389	186,327
Wiring work unbilled	32,002	60,873
Acts. and notes receiv. and mun. warrants.	2,305,802	1,267,039
Special deposit	.....	44,233
Cash	1,066,399	809,701
Total assets	$62,121,707	$57,213,883

LIABILILTIES.

Preferred stock	$ 7,672,000	$ 7,672,000
Common stock	11,971,600	11,951,600
Bonds and notes	36,195,800	32,781,000
Accounts payable	561,858	559,936
Notes payable	*725,205	120,339
Customers' deposits	76,909	49,230
Extension deposits	265,415	.....
Interest accrued	527,266	514,152
Taxes accrued	234,818	267,183
Reserves	112,856	.....
Amort. and dep. res.	2,548,139	2,185,559
Surplus	1,229,841	1,112,884
Total assets	$62,121,707	$57,213,883

*subsequent to Dec. 31, 1918, bank loans amounting to $613,500 have been paid off.

Indiana Utility Commission Approves Bond Issue.

The Indiana Public Service Commission, in the largest and most important reorganization plan ever approved in the history of the present commission, has allowed the Evansville & Ohio Valley Railway Co. and the Evansville Railways Co. to issue securities in the amount of $2,150,000. The issues which have been approved are as follows: $750,000 5%, 30-year first and refunding bonds; $750,000 general mortgage 30-year income bonds; $150,000 10-year 6% notes; $200,000 6% preferred non-cumulative stock; $300,000 common stock. The reorganizers asked for a common stock issue of one million dollars, but, upon advice from the commission, this was lowered to $300,000. At first it was thought that the commission would not approve a financial plan of over two million dollars, but the amount of $2,150,000 was ratified later.

Bill Introduced to Prevent Breach in Contracts.

Representative Howard, of Cowley county, Kansas, has introduced a bill into the Kansas house of representatives intended to compel public utility corporations and their stockholders to comply with their part of city franchises. The bill recites that a franchise for a public utility in a city has been held by the courts to be a contract and that the city must comply with the terms it has granted. It further shows that it has become, and often is, a common practice for utility corporations to dodge the terms of the franchises and to break the contracts with the cities. The bill provides that every stockholder in a public utility corporation is held to be a partner in the enterprises, the city, the county or the state being allowed, if the bill is passed, to sue the stockholders individually to compel the specific performance of the franchise terms by the corporations and by the stockholders. Mr. Howard said that the bill was intended to stop the corporations from trying to break their franchise contracts by making the stockholders individually responsible for the full compliance with the terms of the franchise. Under the present laws of Kansas the corporation only can be compelled to keep up the contract and the stockholders have no responsibilities in maintaining service or rates which the franchise requires.

Plans for reorganizing the Michigan Power Co. have been drawn up and have been deposited with the First Trust and Savings Bank, Cleveland, Ohio. George W. York is chairman of the bondholders' protective committee representing the first mortgage 5% gold bonds.

Brooklyn Edison Elects Officers.

At the annual meeting of the stockholders of the Brooklyn Edison Co., Brooklyn, N. Y., held on Feb. 24, the following were unanimously re-elected as directors for the ensuing year: Frank Bailey, Charles A. Boody, James C. Brady, H. L. Bridgman, William C. Courtney, Daniel J. Creem, H. C. Du Val, Walton Ferguson, George B. Gallagher, William V. Hester, Adrian T. Kiernan, Thomas E. Murray, J. N. Wallace and W. F. Wells.

Bill to Prohibit Revise in Contracts.

A bill to amend the Illinois Public Utilities Commission act has been introduced in the Illinois legislature by Representative Lyon which would prohibit the commission from revising or altering in any manner a contract between a municipality and a public utility corporation. The measure, which carries an emergency clause, went to the committee on public utilities. Its effect would be to give the cities home rule.

Dividends.

Colorado Power Co. has declared a quarterly dividend of ½%, payable April 15 to stockholders of record Feb. 28; also a quarterly dividend of 1¾% on preferred stock, payable March 15 to stockholders of record Feb. 28.

American Telephone & Telegraph Co. has declared a quarterly dividend of 2%, payable April 15 to stock of record March 16.

Northern Ohio Electric Co. has declared a quarterly dividend of 1¾% on preferred stock, payable March 1 to stock of record Feb. 21.

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Feb. 18.	Bid Feb. 25.
Adirondack Electric Power of Glens Falls, common	6	13	11
Adirondack Electric Power of Glens Falls, preferred	6	72	72
American Gas & Electric of New York, common	10+extra	98	98
American Gas & Electric of New York, preferred	6	43	43
American Light & Traction of New York, common	..	240	240
American Light & Traction of New York, preferred	6	98½	98½
American Power & Light of New York, common	4	57	57
American Power & Light of New York, preferred	6	75	75
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	7	34	33
American Telephone & Telegraph of New York	..	101	104½
American Water Works & Elec. of New York, common	..	4	4
American Water Works & Elec. of New York, particip	7	10	10
American Water Works & Elec. of New York, first preferred	..	56	50
Appalachian Power, common	..	2	2
Appalachian Power, preferred	7	14	12
Cities Service of New York, common	+extra	320	338
Cities Service of New York, preferred	6	80½	80
Commonwealth Edison of Chicago	8	111½	113
Comm. Power, Railway & Light of Jackson, common	..	19	19
Comm. Power, Railway & Light of Jackson, preferred	6	40	40
Federal Light & Traction of New York, common	...	11	9
Federal Light & Traction of New York, preferred	..	39	40
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	20	20
Middle West Utilities of Chicago, preferred	6	50	50
Northern States Power of Chicago, common	..	69	72
Northern States Power of Chicago, preferred	ex.div.7	90	90
Pacific Gas & Electric of San Francisco, common	..	50	49
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	88	89
Public Service of Northern Illinois, Chicago, preferred	6	88½	89
Republic Railway & Light of Youngstown, common	4	16	16
Republic Railway & Light of Youngstown, preferred	6	54	54
Standard Gas & Electric of Chicago, common	..	21	25
Standard Gas & Electric of Chicago, preferred	6	37	41
Tennessee Railway, Light & Power of Chattanooga, common	..	2¼	2¾
Tennessee Railway, Light & Power of Chattanooga, preferred	6	13	15
United Light & Railways of Grand Rapids, common	4	36	36½
United Light & Railways of Grand Rapids, preferred	6	69	70
Western Power of San Francisco, common	..	18	18
Western Union Telegraph of New York	extra	87	87
Industries—			
Electric Storage of Philadelphia, common	4	58½	50
General Electric of Schenectady	8	150	754
Westinghouse Electric & Mfg. of Pittsburgh, common	7	42	43¾
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	55	55